The Madras Agricultural Journal.

(ORGAN OF THE M. A. S. UNION)

Vol. XXVII.] NOVEMBER 1939 [No. 11.

EDITORIAL

Science and the Indian Farmer. It is now eleven years since the Royal Commission on agriculture in India remarked that in spite of marked progress in several directions, agricultural research in India was still in its infancy. Feeling that the claims of research had till then received only a half-hearted recognition, the Commission recommended the formation of a central organisation to promote, guide and co-ordinate agricultural research throughout India. These recommendations have borne fruit and it is a matter for gratification that the achievements of the Imperial Council of Agricultural Research during the short period of its existence, are of a high order. Besides its own achievements, the existence of this body has given additional impetus to the efforts of the provinces and states in the solution of their agricultural problems.

Now that the Empire is involved in a war any attempt to curtail the expenditure on agricultural research or to cripple the finances of the central body is to be deprecated. Far from curtailing her agricultural activities Britain has shown the lead to the rest of the Empire by improving her home production. Parts of the Empire which lie in the tropical and subtropical regions and whose populations subsist on agriculture have a duty to redouble their efforts in the improvement of their basic industry. The expansion and increase in value of their exportable produce would not only enhance their prosperity but also serve as the surest bulwark for the Empire in a long-drawn struggle where economic superiority would count more than armaments. We trust that this fundamental fact would be recognized by the central and provincial governments in India and that no efforts would be spared to promote research and to harness the results in the production of food stuffs and other essential commodities in the country.

Coffee in South India.

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Historical. Coffee is said to be indigenous to Africa, Abyssinia being the original home, from where it was first introduced into Arabia in the 4th century A. D. Introduction of coffee on a commercial scale to the rest of the world dates only from the 16th century A. D. In India coffee is believed to have been first introduced into Mysore in 1600 by a Moslem pilgrim named Baba Budan, who on his return from Mecca brought a few seeds and sowed them in the hill, which later came to be known as Baba-Budan-Giri in north Mysore. But Baba Budan is reported to have been not interested so much with coffee as an article of beverage as in the production of its fragrant blossoms with which be decorated his mosque. Although Mysore was the first to introduce coffee in India, nothing substantial was done in the direction of extending coffee cultivation till the end of the 18th century. Large scale planting was taken up only in 1835 and hence this industry is only about 100 years old in this country.

The area under coffee in S. India and its relative importance to other plantation crops is furnished in the following table :—

Area in S. India under coffee (corrected to 00, compared with other important hill crops).

District.	Coffee area.	Tea area.	Rubber area.	Cardamom area.	Cinchona
Coimbatore	2,800	25,300	600	3,000	1,100
Madura	10,500	800	500	1,000	...
Malabar	2,200	1,000	12,400	500	1
Malabar Wynad	5 500	12,400	200	200	...
Nilgris	13,800	24,800	600	13	1,000
Nilgris Wynad	5,000	13,900	600	3	...
Shevaroys	9,500	...	100	18	...
Tinnevelly	400	600	...	100	...
Vizagapatam	600	...	...	...	...
Madras Presy. Total	50,300	78,800	15,000	4834	2,101
Coorg	45,000	400	3,000	3,900	...
British India. Total	95,300	79,200	18,000	8,734	2,101
Cochin	1,600	1,700	11,700	600	...
Mysore	103,500	4,300	600	21,800	...
Travancore	6,200	77,000	97,000	55,000	...
S. Indian States. Total	111,300	83,000	109,300	77,400	...
S. India. Total	206,600	162,200	127,300	86,134	2,101

Varieties. Coffee belongs to the natural order *Rubiaceae*. The genus *Coffea* has about twenty five species in the tropics of the old world, mainly

in Africa. Some of the known forms are the Mocha, Blue-mountain and Nyassa--which are said to be geographical growth forms or varieties of Coffea arabica. Some of the more important economic types are the Sierra Leone coffee (*C. stenophylla*,) Congo coffee (*C. robusta*) and *C. excelsa*.

Coffea arabica :— This is a king of the coffee tribe. It is an ever green plant which grows to a height of about 20 feet under natural conditions with oblong-ovate, acuminate, smooth and shiny leaves measuring about 6 inches in length and 2½ inches wide. Its flowers which are produced in dense clusters in the axils of leaves, have a five toothed calyx, a tubular five lobed corolla, five stamens and a single bifid style The flowers are white in colour, with a fragrant odour. The fruit is a fleshy berry, having the size and appearance of a small cherry and assumes a red colour when ripe. Each fruit contains two seeds embedded in an yellowish pulp and seeds are enclosed in a thin membranous endocarp (the " parchment "). Between each seed and the *parchment*, is a delicate covering called the "*silver skin*". The seeds are plano-convex in form, the flat surfaces which are laid against each other within the berry having a longitudinal furrow or groove. Occasionally, when only one seed is developed in a fruit, it is not flattened but circular in cross-section, which forms the "*pea-berry*" coffee of commerce.

C. robusta :— A more recent introduction than *C. arabica*. It has replaced Arabica, which is highly susceptible to diseases. It is sturdier and more vigorous than arabica—a late bearer but prolific. Leaves are bigger but the fruits are smaller than those of arabica and thrives well at low elevations.

C. Liberica : — The Liberian coffee is a native of the west coast of Africa, grows wild in great abundance along the whole of the Guinea coast. The leaves, flowers and fruits are larger; and the plant is of more robust and hardy constitution than arabica. The seeds yield a highly aromatic and well flavoured coffee (but by no means equal to the arabica).

Climate and Soil. In Mysore 4500 feet is said to be the limit at which coffee can bear, whereas good healthy plantations at 5000′ to 6000′ are seen in the Nilgiris. Aspect and exposure are important factors. High altitudes with suitable soil produce a very good quality of bean, for it must be remembered that in coffee, it is not only the quantity but also the quality that counts. Mysore which has the largest area under coffee in India, has most of its plantations at altitudes of 3000 to 4000′ with an annual rainfall of 50 to 130 inches.

Coffee is essentially a surface feeder and therefore the richer the top soil the better. In fact the coffee growing land is in the hill tract which has luxuriant forest growth and this is a positive indication of the inherent fertility of the soil. The fertility of any piece of coffee land over long periods should depend on the optimum depth of surface soil in which a high humus and nutrient status is maintained by resisting soil erosion and preserving

right physical properties. High water holding capacity is a most important property of these soils for they must be able to retain as much of rain water as possible which they can give up again to meet the requirements of the crop during prolonged periods of drought. A forest loam of 7 to 8 feet depth with the above mentioned properties is the most ideal for coffee growing although coffee can grow in a variety of soils from clayey to sandy loams.

Transport and Labour. The estate must be approachable by roads which are necessary for the transport of produce to the nearest railway station or to the curing houses and this is not a matter of great difficulty in these days of motor traffic. Supply of labour should be well organised and this is usually done by 'agents' or 'labour suppliers' with whom the planter should deal tactfully. The coolies of the estate are given an advance of Rs. 5 to Rs. 10 in the beginning of the year through the agent who supplies the coolies and this is recovered from the wages earned by the coolies during the rest of the year. The agent earns a commission of about 10% on the out-turn of work. The agent earns the commission regularly but he is responsible for the amount advanced to the coolies. The supply of labour to an estate may be from the villages round about, and more often they come from neighbouring districts but it is not unusual to see some from distant districts.

Raising of the Nursery. Seed is purchased from reliable planters and sown in the germination beds. Ripe red "cherry" from selected plants are picked and the beans are separated from the pulp by treading them under feet. The beans are then put in water, well stirred, floating beans are rejected, and the rest are put in mats or sieves, mixed with wood ashes and dried in the shade for a week. The seeds are now ready for sowing in the beds.

Germinating beds. These are raised beds of 3 to 4 feet width and any convenient length. A fine tilth is necessary. Seeds are dibbled in these beds 1 inch apart and the seed bed is covered with straw or fern placed over wooden or bamboo poles kept across the beds. The seed bed is watered twice daily and germination takes place in four to six weeks. The seedlings plants remain in the bed for about six weeks when they are transplanted either in nurseries or baskets.

Nursery. The nursery is raised in the same manner as the germinating beds. The raised beds are of fine tilth and are manured with well rotten cattle manure or compost. A temporary *pandal* is erected over the nursery to ward off the severe sun. As the seeds germinate in the seed bed or after the cotyledon leaves open, the seedlings are carefully lifted without damage to their roots and planted in the nursery six inches apart. Planting is done by making a hole to the required depth of the tap root with a wooden peg, care being taken to see that the tap root is not bent Earth at the base of the seedlings is firmly pressed around the seedlings to give them a foothold. Watering is thereafter done twice a day till the seedlings are established. The plants are ready for planting in 9 to 12 months.

Basket Plants. Another desirable method of raising seedlings is in baskets, in which the seedlings grow vigorously and this system is to be advocated although it is slightly more expensive. Bamboo baskets of 3 to 4 inches diameter and 9 inches depth may be purchased at about Rs. 5 per 1000. These are filled with virgin jungle soil, well mixed with well decomposed farm yard manure and the germinated seedlings which are about four to six weeks old in the nursery are planted in them. The baskets are arranged in rows to give the same spacing as the plants in the nursery and treated in the same way. Plants raised in this manner are ready for planting in six months. The baskets are directly transferred to the planting pits.

Laying out of the Plantation. The block of land where coffee is proposed to be planted is to be cleared first. In modern plantations, coffee is grown under regulated shade in which case the entire area is to be completely cleared and fresh shade trees planted, but if there are suitable trees in the jungle they are left as such. Rain water dripping from big trees has an adverse effect on the growth of young coffee plants. The required number of shade trees at 25 to 50 feet apart are planted and roads and drains are laid out to suit the contour of the land. The land is thus got ready for planting.

Lining. This is the first operation before planting. This consists of marking out pegs at the places where pits have to be dug. The land being usually in a slope, it is advisable to form the lines across the slope which will greatly minimise the chances of soil erosion. The usual spacing is 6′ by 6′ for arabica plants and 8′ to 9′ for robusta. Pegs are driven after proper alignment and pits $1\frac{1}{2}'$ cube are dug in January—February to enable the planting being done in June after proper weathering of the sub soil in the pits. 1200 pits go to the acre at 6 feet spacing.

Importance of shade Shading of coffee trees is an important item. Shading has manifold advantages in that, it protects the crops from the severity of summer heat, helps the conservation of soil moisture by reduced evaporation, maintains an equable temperature and humid conditions which are necessary for the production of even and regular crops and replaces the valuable humus of the soil and produces a mulch of fallen leaves. Besides these, shade mitigates the damage by borer and leaf diseases, both of which are favoured by high light intensities. It seems likely that if it were not for the pests, shade in South India might be kept lighter than it normally is. Apart fron *Grevillea robusta* and *Erythrina lithosperma* whose function is mainly as nurse trees, several species of *Albizzia* and *Ficus, Pterocarpus marsupium, Artocarpus-integrifolia Terminalia belerica, Dalbergia latifolia, Eugenia jambolana* etc. are planted, the choice of the variety depending on the local conditions. It is to be noted that coffee is naturally an undergrowth species and recent work in Africa has shown that coffee does not properly photosynthesize at full capacity in full sunlight. Stakes of Dadap (*Erythrina lithosperma*) are planted at 12 ft. apart in a newly cleared

area. By gradual ringing out, the permanent shade trees of a plantation are so maintained as to have trees at about 40′ apart.

Planting. The pits are filled with the top soil. The seedlings raised in the nurseries are planted in the month of June with the advent of south west monsoon showers, whereas the basket plants which are more vigorous and healthier are planted in September (close of the S. W. Monsoon) as a smaller amount of rainfall is sufficient for the establishment of these plants. During planting, care is taken to see that the plants are inserted in the centre of the pits so that all the plants in a row may be in a line. If necessary the tap root may be slightly pruned and then planted. The basket plants are introduced into the pits with the basket. The seedlings after planting are given some shade by sticking in leafy branches close to them.

After-cultivation. In normal practice, young coffee is intercultivated during the first two or three years, usually about October. As the coffee closes in, this cultivation is restricted to a smaller area to minimise root injury. On the whole, where mulch and shade are good, regular intercultivation with implements is to be avoided. Hand weeding is done two or three times a year, to have the estate free of weeds before the end of the north east monsoon rains. In some plantations of the *malnad* area two *mummatty* hoeings are given. The first operation immediately precedes the S. W. Monsoon, when the soil round the plants is dug out to create a loose mulch. This is known as '*Kochu-agathe*' in kanarese. The second operation done in September – October involves the burial of weeds in addition to digging round plants and hence called '*Muchu-agathe*'.

Manures and Manuring. Although coffee soils are usually rich in organic matter and humus, it is not possible to raise successful crops of coffee year after year without manuring Whatever may be the inherent fertility of these soils, it is not inexhaustible and manuring becomes a prime necessity. Farm yard manure, pulp compost and compost of leaf and other vegetable debris are the chief sources of manure in a coffee estate. A basket of the compost (30 to 40 lbs) or cattle manure is applied per plant once in four years with good results. The manure is either applied round the plants and then forked in or applied in semicircular trenches dug round the plants and covered. These trenches are dug at the sloping side of the land. Coffee responds to manuring with artificial fertilisers containing suitable proportions of Nitrogen, Potash and Phosphorus and these are applied round the plants and forked in. A mixture of artificial fertilisers containing N, P & K in the proportion of 1 : 2 : 3 is said to greatly augment the yields. The results of manurial trials on coffee at the Balehonnur Experimental station indicate that a complete fertiliser consisting of N, P, and K has given the best result—the amount of application being; N-20 lbs, P_2O_5—30 lbs and K_2O—60 lbs. per acre. Nitrogen is supplied in the form of ground nut cake, ammonium sulphate, nitrate of soda, or am. phosphate, P_2O_5 in the form of any phosphatic manure like, superphosphate, bonemeal and potash in the form of potassium sulphate. The time of application is usually in

September. Studies for determining the optimum conditions of soil reaction for the growth of coffee have been pursued at the Balehonnur Experimental station by growing the plants in Hydrogen ion cisterns in which the soils have been rendered artificially alkaline or acidic with pH values varying from 4·5 to 8. "An almost neutral condition of soil is indicated to be very favourable for the healthy growth of coffee".

Topping. In about two to three years after planting, coffee attains a height of 3 to 4 feet at which stage, the plants have to be topped with a sharp knife. By this method the vertical growth of the plant is maintained at a definite height. The first topping is done at a height of 2½ feet from the ground level and this operation is done by trained coolies. Gradually the plants grow and consequent to this operation, new 'suckers' are put forth and the height of the plants is increased to 3½ to 4 feet by annual toppings. This is the maximum limit of height to which coffee can be allowed to grow and this height is maintained throughout the life of a plant as picking of berries is convenient at this height.

Pruning. Pruning is done regularly and systematically every year for without it, the plants will never yield well. This operation is attended to after the harvest of coffee and ordinarily no pruning may be necessry till the plants are five year old. In Brazil—the premier coffee producing centre of the world, no pruning is done and plants are allowed to grow to 12 to 15 feet high. This is possible in Brazil where the method of cultivation is entirely different, where four plants instead of one are planted in a hole and the soil is of such exceptional fertility. Pruning is an indispensable operation which consists in cutting back of old wood which has borne one or two crops, to the point of origin of newer wood, removal of 'gormandisers' (branches growing vigorously upwards which sap the vitality of the tree) and superfluous wood. Though pruning is normally done after a crop 'suckering' is done during weeding rounds, when the suckers are soft; enough to be pulled out.

Scrubbing of Moss. In the trunks and branches of coffee plants mosses grow luxuriantly, if left undisturbed. The development of moss on the stem of plants weakens them considerably and the moss offers a safe shelter to the stem borer *Xylotrechus quadripes* to lay its eggs. The moss is to be scrubbed off the plants with pieces of gunnies. This is usually done during monsoon or in November with the dual purpose of removing moss and smoothening out bark crevices and crushing borer eggs which may occur in them.

Flowering and Fruiting. An inch of rainfall in the month of March. after a dry spell of about two months is greatly needed for the proper opening of the 'spikes' and setting of the blossom and this rain greatly influences the yield. Although rain fall at this time is an important factor the condition of the plants in the preceding N. E. Monsoon season, largely determines the yield, all manuring and cultural operations notwithstanding

Harvesting. Harvesting begins in the month of November—December and it takes nearly seven months for the berries to ripen. Coffee begins to bear in the 3rd or the 4th year but full bearing is attained from the 6th to 8th year. Harvesting in arabica plants—which are early bearers begins in November—December, whereas in robusta it is in January—February. The crop does not ripen uniformly; hence coolies are sent to pick the berries as they ripen. The pickers run from plant to plant picking only the ripe berries and this is called 'fly picking'. Thereafter, the berries ripen in larger numbers and the collection of ripe berries is repeated four or five times. In the end, both the ripe and unripe berries are picked together and this method of picking is known as 'stripping.' The stripped produce is kept and dried separately. A cooly can pick as much as 1 to 1½ bushels of berries in a day when the crop is in full swing—a bushel of ripe berries weighing about 55 lb. Picking of berries is done by the coolies in baskets or gunnies which are tied round their waists.

The last operation is 'gleaning' which consists in picking fallen berries and beans and also those that have been eaten by monkeys and squirrels and deposited in the field. Boys are sent for this work and are paid about 6 pies for a seer (2 lb.) of beans collected.

Yield. In India the average yield is about 500 lbs. of cured coffee per acre. The ordinary yield of a coffee plantation in the 4th year of planting is about 50 lb. per acre rising up to 150 to 200 lb. in the 5th year, 300 lbs. in the 6th and 500 lbs. in the 7th and succeeding years. This yield is maintained, under favourable conditions till the plants are about 50 years old. The yield of a plantation is estimated by the planter as so many bushels of cherry per acre and this gives an idea of the quantity of the finished product, as the finished produce is roughly one fifth to one sixth of the weight of the 'cherry'.

Preparation of Coffee for the Market. Much experience is needed in the preparation and grading of the produce after harvest as the quality of the resultant product mostly depends on how best the commodity is dealt with. Other conditions being equal, the price chiefly rests with this factor.

The pulp house and the pulping machine. The pulping house and the machinery are erected at the lower reaches of the plantation and the drying grounds are prepared nearby. The size of the building and the machinery depends on the maximum expected daily harvest during the crop period. An unfailing supply of fresh water is indispensable for pulping operations. Water supply is usually obtained by erecting dams across natural streams or from wells dug at a higher level than the pulping house, pumped and led through pipes to the pulping machine. Pulping machines are of various makes and designs, but all are the same in principle. The essential parts of the pulping machine consist of two pairs of metallic discs one pair fixed below the other. The discs are covered with copper sheets having rough excrescences on the surface. The pulping machine is connected on to a motive power with a horizontal connecting rod with suitable

gears and crank shaft arrangement. The motive power may be an oil engine, a water turbine or bullock power. The bullocks work the pulper in the same fashion as a sugarcane mill or the persian water wheel, where the connecting rod is fixed on to a bevelled gear.

The discs of the pulper are adjusted so as not to crush the beans but only squeeze out the bean out of the cherry. There is also another kind of pulper called the barrel or breast pulper in which a cylinder is rotated against fixed 'chops' called breasts. Small estates use hand pulpers.

Pulping. The days' picking of cherry is collected on a loft above the pulper usually on the top floor of the pulp house. It is to be emphasised that only ripe red cherry are to be selected for pulping—discarding all the half ripe and immature ones, which go with the stripped produce for drying separately. The pulper is worked and the cherry is fed to the pulper through a stream of water over a catch pit to prevent the flow of any stones into the machine which will damage the discs and throw the machinery out of work. Great precaution is to be taken in this direction, to see that the machinery is in perfect condition as otherwise considerable loss is likely to be caused by the cessation of work resulting in the deterioration of the cherry which affects the quality of the produce. The pulped beans flow with the running water to the masonry vat filled with water, while the pulp is ejected through separate channels. After pulping is over, water from the vat where the beans have collected, is completely, drained and the beans are heaped and stored for fermentation in the vat for about 36 hours. The fermentation is necessary to get rid of the saccharine slimy coat on the parchment and this must be carefully attended to, as excess or insufficient, fermentation affects the quality of 'coffee. After optimum fermentation the beans are vigorously trampled under feet and washed with three to four changes of water till all the slimy, matter is completely got rid of.

During the cleaning of the beans in the vats after fermenation, beans that float in the water are separated, dried and marketed as 'lights' whereas such of the beans from which the seed coat and pulp has not been fully removed, are again dried and marketed as 'tails'.

The cleaned beans are then transferred to drying tables covered with coir mattings or which consist of wire trays where they are dried for about a fortnight. Drying is stopped when a struck bushel weighs 33 lb. and at this stage, they are bagged and are ready for transport to the curing factories. In the curing factories, parchment is hulled polished, picked, and graded. Single beans from this lot are picked and bagged separately and this goes under the trade name of "pea-berry" whereas the double beans are sold as "parchment". In S. India the pea-berry fetches a premium of Rs. 80 to 100 per ton over 'parchment.'

The strippings are dried in the sun as they are picked. Each day's collection is separately dried and the berries get a dark colour as they dry. In small plantations where there are no facilities for pulping, even the ripe berries are treated in the same way as the strippings and are dried. Drying is complete in a week to 10 days, when they are put in a huller or pounded in a mortar for the removal of the dry skin which becomes hard like shells of groundnuts. After hulling the produce is cleaned and bagged and sent to the curing factories as 'Cherry' or 'Native coffee'. In the curing factories these are graded in sieves, further picked and graded. This is the quality that is mostly in demand for local consumption by middle class people, as it is comparitively cheaper.

Price of coffee. The price of coffee is the vital factor that governs the conduct of various agricultural operations in the cultivation of this crop. The price per ton of coffee was Rs. 1500 to Rs. 1800 during the boom period as compared with the present rate of about Rs. 650. The future of this industry appears to be dark unless there is rise in price. Planting will only thrive if the price reaches a level of at least Rs. 800 to 1000 per ton.

Longevity of coffee. The longevity of a coffee plant depends mostly on the efficiency of management, the soil conditions and freedom from diseases. The plant begins to bear in the 4th year, attains full bearing capacity in the 7th or 8th year and continues to do so, under normal conditions for 70 to 80 years. There are plantations that are about 60 to 70 years old and are still yielding well and under ideal conditions they may continue to yield well up to 80 to 90 years.

Pests and diseases of coffee. Squirrels, monkeys, porcupines and other wild animals cause damage to a coffee plantation. Monkeys in herds attack a crop when the berries are ripe and cause considerable damage—but this after all is a minor matter compared with insect pests and fungus diseases. Some of the insect pests, in the order of importance, are the coffee stem borer *(Xylotrechus quadripes)* green bug *(Lecanium viride)* black or brown bug *(Saissetia haemispherica)* and twig borers *(Xyleborus pp).* The stem borer lays its egg singly in the crevices of coffee stem. The hatching of eggs is favoured by hot sunshine, the larva bores a hole into the stem and spends the rest of the period in its life history inside the plant, taking nearly 9 months for pupation. The pest is most active in the adult stages in October —November and scrubbing operation designed to crush the eggs must be done at this stage. Tar wash applied to the affected stems kills the eggs.

Among the fungoid diseases, 'leaf disease' caused by (*Hemeleia vastatrix*) black rot' caused by (*Corticium koleroga*) and die back' associated with a species of *Gloeosporium* are the most common. While breeding of disease resistant varieties is the most effective weapon to combat these diseases, spraying with Bordeaux mixture is the first line of defence. A half per cent mixture is found to be as effective as one per cent and this is very widely practised.

Cost of raising a garden up to the bearing stage In estimating the cost of bringing a coffee plantation up to the stage of bearing two things are to be borne in mind, viz, the capital outlay and the recurring charges. The former depends on the extent of cultivation and the proportionate cost of fixed charge will have to be added to the recurring charges to give a correct estimate of raising an acre of coffee till the bearing stage. 200 acres of coffee plantation will be a fair unit for working out the fixed charges and on this basis the following figures are computed. The figures, naturally, are variable from tract to tract.

TABLE I. Fixed and Annual Recurring Charges for a Plantation of 200 acres of Coffee.

Capital Outlay :					
Cost of 200 acres of coffee land @ Rs. 50 per acre	...	Rs.	10,000	0	0
Bungalow for the owner or the Superintendent	...	Rs.	5,000	0	0
House for the estate conductor or clerk	...	Rs.	1,000	0	0
Store and drying floor	...	Rs.	1,000	0	0
Pulping house, vats, barbecues etc.	...	Rs.	2,000	0	0
Machinery for Pulping and accessories	...	Rs.	1,500	0	0
Provision of water supply (well etc.)	...	Rs.	500	0	0
Cooly lines, 50 at Rs. 100 per house	...	Rs.	5,000	0	0
Tools and implements	...	Rs,	500	0	0
Sprayers	...	Rs.	2000	0	0
Sundries	...	Rs.	500	0	0
Total	...	Rs.	29,000	0	0
Annual Recurring Expenditure :—					
Superintendent @ Rs. 200 per month	...	Rs.	2,400	0	0
Conductor's or clerk's pay at Rs. 40 per month	...	Rs.	480	0	0
Watchmen—two at Rs. 8 per month	...	Rs.	192	0	0
Storekeeper at Rs. 20 per month	...	Rs.	240	0	0
Medicines—cost of	...	Rs.	50	0	0
Stationery, postage and books	...	Rs.	100	0	0
Upkeep of buildings (2% on cost)	...	Rs.	250	0	0
Roads and drains—Repairs and upkeep	...	Rs.	200	0	0
Maistries 3—@ Rs. 12 per month	...	Rs.	432	0	0
Spraying materials and labour for spraying @ Rs. 8 per acre	...	Rs.	1,600	0	0
Repairs to tools and machinery	...	Rs.	200	0	0
Shade regulation; renovation and sundries	...	Rs.	200	0	0
Transport etc.	...	Rs.	100	0	0
Allowances, commission etc.	...	Rs.	300	0	0
Total	...	Rs.	6,744	0	0

TABLE II-A. Cost of cultivating one acre of Coffee up to the period of full bearing—1st year.

Cultivation details.		Expenditure.			
Preparatory Cultivation.					
Clearing jungle growth, felling forests and burning etc.— 120 coolies at 4 annas each	...	Rs.	30	0	0
Lining 6′ × 6′ and Pegging—8 @ 4 annas	...	Rs.	2	0	0
Digging pits—1200—1½ ft. cubs--40 @ 4 as.	...	Rs.	10	0	0

Filling pits—12 @ 4 as.	... Rs.	3	0	0
Digging 300 pits for shade trees and filling 15 @ 4 as.	... Rs.	3	12	0
Seeds and Plants.				
Planting 300 shade trees—2 @ 4 as.	... Rs.	0	8	0
Planting 1200 coffee seedlings —8 @ 4 as.	... Rs.	2	0	0
Cost of 300 seedlings for shade trees 12′-12′ 2 Rs. per 100	... Rs.	6	0	0
Cost of 1200 coffee seedlings @ 2 Rs. per 100	... Rs.	24	0	0
Providing temporary shade—6 @ 4 as.	... Rs.	1	8	0
After cultivation.				
Hoeing round plants once—50 @ 4 as.	... Rs.	12	8	0
Weeding twice—32 @ 3 as.	... Rs.	6	0	0
Agent's commission on labour charges alone (10% on Rs. 70)	... Rs.	7	0	0
Assessment on land per acre	... Rs.	1	8	0
Total expenditure for the first year	... Rs.	109	12	0

TABLE II-B. **Details of cost of cultivation from the 2nd to 7th year.**

Details of operation.	2nd year.	3rd year.	4th year.	5th year.	6th year.	7th year.
Hoeing round plants once 50 @ 4 as.	12 8 0	12 8 0	12 8 0	12 8 0	12 8 0	12 8 0
Weeding twice 32 @ 3 as.	6 0 0	6 0 0	6 0 0	6 0 0	6 0 0	6 0 0
Manuring with 1200 baskets of F. Y. M. @ 50 baskets per Rupee.	*6 0 0	*6 0 0	*6 0 0	*6 0 0	*6 0 0	*6 0 0
Applying manure 16 @ 4 as.	*1 0 0	*1 0 0	*1 0 0	*1 0 0	*1 0 0	*1 0 0
Topping 1200 plants 8 @ 4 as.	...	2 0 0	...	...	...	...
Suckering and pruning	...	...	5 0 0	8 0 0	8 0 0	8 0 0
Picking coffee and Preparing @ 8 as. a bushel	...	...	2 8 0	10 0 0	15 0 0	25 0 0
Agents commission @ 10% on Labour cost.	2 0 0	2 0 0	2 12 0	3 12 0	4 4 0	5 4 0
Assesment on land	1 8 0	1 8 0	1 8 0	1 8 0	1 8 0	1 8 0
Cost per acre	29 0 0	31 0 0	37 4 0	48 12 0	54 4 0	65 4 0

* As farm yard manure is usually applied once in four years the cost of 1200 baskets of manure (24—0—0) and the cost of applying (4—0—0) is proportionately charged for each year.

Total cost of one acre from the first to the 7th year is	Rs.	375	4	0
Yield of coffee in fourth year— 50 lb @ Rs. 7 per 25 lb	Rs	14	0	0
Do. fifth do. 200 lb @ Rs. 7 per 25 lb	Rs.	56	0	0
Do. sixth do. 300 lb @ Rs. 7 per 25 lb	Rs.	84	0	0
Do. seventh do. 500 lb @ Rs. 7 per 25 lb	Rs.	140	0	0
Cost of produce up to the 7th year	Rs.	294	0	0

From the details given above, it can now be seen that for the management and cultivation of a 200 acres coffee estate, Rs. 29000 are required for capital expenditure, Rs. 6744 towards annual recurring expenditure, besides the actual cost of cultivation. The cost of raising an acre up to the stage (7th year) of full bearing may be classified as follows.

1. Interest on capital Rs. 29000 @ 4%.
2. Annual recurring expenditure.
3. Cost of cultivation.

Particulars.	for 200 acres per year	for 1 acre per year	for 1 acre for 7 years
Interest @ 4% on Rs. 29,000	1160 0 0	5 13 0	40 11 0
Annual recurring Expenditure	6744 0 0	33 11 0	235 13 0
Cost of cultivation	...	...	375 4 0
Total			651 12 0
Less the value of produce up to 7 years			Rs. 294 0 0
Net cost of raising an acre up to 7th year			Rs. 357 12 0
			or Rs. 358 0 0

Net cost of bringing 200 acres to bearing stage Rs. 71600.

From the Table II-b, it is evident that coffee begins to pay from the 5th year with a distinct margin of profit.

Economics. From the above statement it is seen that the owner of a 200 acre plantation has invested Rs 29,000 on capital outlay and Rs. 71,600 on cultivation and recurring expenditure. He would have thus invested Rs. 104600 at the end of 7th year on a 200 acre estate. From the 7th year onwards he gets a net profit of Rs. 47 per acre or Rs. 9400 on the holding which works out to a 9% return on invested capital.

Summary and Conclusions. Coffee is an important South Indian industry. Although the yield in Indian plantations is comparatively poor the quality of the produce is one of the best in the world.

The yield of coffee is largely dependent on the blossom showers in March and the condition of the plants in the preceding North-East Monsoon season.

Coffea arabica—the finest of the coffee species is being fast replaced in the lower elevations by robusta—a prolific bearer of low grade. The replacement of arabica by robusta is likely to slacken in the future as the export market for this type is very low and the internal market is reaching saturation. Arabica is highly susceptible to leaf disease.

The cultural and manurial treatments given to coffee plantations at the present time are highly inadequate owing to the tendency on the part of the planters to minimise cost of cultivation as a result of fallen prices.

The future of this industry is dark unless there is a rise in the price level. Protection to coffee as is given for tea and rubber may save the industry from disaster and this is possible only by international negotiations with big producing countries like South and Central America.

Acknowledgements. The writer is greatly indebted to Mr. W. W. Mayne, B. Sc., Coffee Scientific officer of the United Planters' Association of S. India, for reading through his manuscripts and making very valuable suggestions. He is also grateful to Messrs. S. T. Shetty and S. D. Shetty of Umbdi Estate (Koppa-Kadur) for affording him all facilities to gain first hand knowledge of coffee plantation work.

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Some Animals of Agricultural Importance in South India.

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Introduction. Though the great majority of the numerous pests affecting cultivated plants and stored agricultural products all over the world belong to the group of insects, we occasionally come across creatures other than insects which often prove equally injurious. In South India the non-insect forms so far noted include representatives of such animal groups as Worms, Molluscs Crustaceans, Arachinids, and Myriapods among lower animals and such higher forms as monkeys, bats, rodents of sorts, wild animals like elephants, jackals, wild pigs, deer, bison, many birds, and at least one fish.

Non Insect Pests. *Lower Animals.* Among the non-insect lower animals which affect the farmer's crops the more important are eel worms, snails and slugs, crabs, mites, ticks, and millipedes.

Eel worms are very minute worms belonging to the group of round worms *(Nemathelminthes)* and derive their name from their resemblance to fishes called eels. There are numerous forms among these which attack cultivated crops of different kinds often causing serious damage. They attack the rootlets of plants and cause the characteristic knots or nodules in which the worms breed, resulting in the gradual fading and death of such plants. Infested plants when pulled out of the soil, will reveal numerous nodules, and when these are teased and examined under a microscope different stages of these worms can be seen. The most notorious and widely distributed of these eel worms is the root-gall eel-worm

(*Heterodera marioni*, G). This has been noted on numerous crops all over the world, and in S. India, the most important plants subject to such attacks, are pepper, betelvine, brinjal, tomato, tobacco, tea, pulses, turmeric, cucurbits, groundnuts and cruciferous plants like cabbage, cauliflower and mustard. It is often a difficult problem to control the eel-worm pest when the field is badly infested, since the pest remains in the soil even after the field is harvested and is capable of reinfesting the next crop. Rotation of crops, proper disposal of crop-remains after harvest, keeping the land fallow for a few seasons and the use of soil disinfectants are some of the well-known methods of control.

Snails and slugs belong to the group of shelled animals known as Mollusca. Though the great majority of these are aquatic forms, snails and slugs are not strictly aquatic, as they also live on land and are often found feeding on vegetation. Snails have an external spiral shell covering their soft body while slugs do not generally possess such a conspicuous shell. Though these are not regular pests, garden plants of different kinds are occasionally attacked by them. Aloes are sometimes found attacked by snails and holes are found bored on the succulent leaves. In S. India, these generally include species of Kesta, Rhacis and Ariophanta. On one or two occasions, paddy seedlings have been reported as damaged by small snails in parts of the Kistna delta near Tenali. These creatures are seen during wet weather and in damp areas and are generally active during the night. During dry weather, snails may be found sealed fast to various plants and tree stems; they revive and become active with the return of humid and wet conditions. Slugs are soft, flattish, slimy, slow-moving creatures. They are now and then found in numbers in betelvine gardens occasionally nibbling *agathi* (*Sesbania grandiflora*) and betel leaves. These creatures as they move about leave behind them a slimy shining trail on the ground. Generally the damage to plants by these forms is negligible in S. India. When found in numbers, they may be checked by hand picking and by the use of irritants or poison baits. The use of one part of calcium arsenate with sixteen parts of wheat bran mixed dry and moistened with enough water to make the mixture sticky and scattered in the haunts of snails has been found effective against the garden snail in California. Spreading of lime, soot, wood ashes, etc. on the ground also acts as a deterrant against slugs.

Crabs are familiar creatures which come under the group Crustacea in which are also included the prawns, lobsters, water fleas etc. Crabs have a flattish oval body with ten conspicuous legs and the abdomen tucked under the thorax. The great majority of crabs are marine forms. The fresh water crabs are the ones which have been noted to cause considerable damage during certain years to young paddy plants in different parts of India and Burma. In S. India they are frequently reported to cause damage in the Cauvery Delta. Though in their food habits crabs are generally carnivorous, this plant-feeding habit has been noted in some fresh water species. During

the time when the paddy crop is very young these creatures cut the tender plants at ground level and carry the pieces to their holes to be used as food. This is generally done during dusk or at night. The species of fresh water crab commonly noted to cause such damage in S. India is *Paratelpnusa hydrodromus*, H. The pest can be controlled by hand picking, baiting with poisoned food (by dropping the bait into the crab holes) or trapping them in narrow-mouthed earthen pots planted along the edge of the water channels. Though in the Laccadive islands and in the Malay archipelago, a crab known as the coconut crab *(Birgus)* is found as a serious pest of coconut, we have not as yet met with this creature on coconut along our coastal areas.

Mites belong to the class Arachnida which includes the spiders, scorpions, ticks, etc. Mites are minute creatures with oval or elongate oval body having eight legs. Different species are found on plants sucking up the plant sap and causing damage. The effect on the attacked plant is generally a discoloration and paleness due to sap drainage. Often these, mites cause galls on some plants. Well known pests are the Cholam mite *(Paratetranychus indicus*, H.) the citrus mite *(Tetranychus hindustanicus*, H.) the cotton mite (*Anychus latus* C. and F.) the tea mite (*Tetranychus bioculatus* W. M.) and the castor and ganja mite *(Tetranychus telarius* L.). The last one has a world wide distribution and has been noted on numerous other plants also. Ticks and some species of mites attack cattle and other domestic animals and at times on man as skin parasites. Application of flowers of sulphur or spraying with lime sulphur solution will be found effective against mites on plants.

Millipedes are elongate cylindrical creatures occasionally noticed, damaging roots of plants in vegetable gardens and damaging the pods of groundnuts in some areas emptying the shell of its contents. These can be controlled in the same way as cutworms, white ants and wire worms by such measures as the use of poisoned baits, poisoning the irrigation water etc.

Higher Animals. Though fishes are not as a rule known as pests of crops one locally called *Anaikuthu pambu* (*Ophichthys boro*. H.) has been noted as such in parts of S. India. This causes damage to paddy field bunds along the Coromandel coast. It is a long flat eel fish having the general appearance of a snake and lives in the tidal streams and estuaries along the coast. No direct harm is caused to the growing plants but numbers of these eels burrowing into and making passages across the field bunds cause salt water to enter the paddy fields and damage the growing plants. Sometimes damage is also caused to salt pans on the coast. The radical measure of control against this pest is to strengthen the bunds and prevent admission of the fish from the salt water area into cultivated fields. They can also be trapped by mechanical methods and destroyed. Among the well known higher forms of animals found doing damage to crops may be included rats, squirrels, rabbits, monkeys, flying foxes (Pteropus) and some graminivorous and fruit-eating birds. Among rats there are some

species which live in fields and attack crops like paddy, sugarcane, coconuts, etc., while there are others which are household and granary pests. The most destructive and well-known of our field rats damaging crops are the mole rat, (*Gunomys kok*) the Indian Gerbille, (*Tatera cuvieri Gr.*), the coconut attacking species *Rattus rattus*, Bl., and the common house rat *Rattus rufescens*, G. In parts of the Malabar coast there is an aquatic rat known locally as *Neeteli* often causing severe damage to the paddy crop which is just putting out earheads. Squirrels are also troublesome in fruit and vegetable gardens and farm houses where grains and seeds are exposed for drying. The flying squirrel known as *Pathada* in S. Malabar also destroys tender nuts on coconut trees. The depredations caused by monkeys in different parts of the country are well known. The flying fox (Pteropus) a species of large bat is often found in colonies on some trees. These cause damage to fruit crops in the surrounding areas.

The usual control measures against the above mentioned pest consist of poisoned bait traps, or fumigation of their habitations. For the coconut tree rat, galvanised iron bands may be fitted to prevent them climbing the tree. In addition to rats and squirrels, field crops in some areas are often subject to the attacks of jackals, wild boars, mangooses, toddy cats, porcupines, bison, deer and even elephants; especially is this the case in forest tracts and in areas along the foot hills of the western ghats. Jackals are partial to sugarcane and wild pigs to root crops and paddy. The control of these pests in the case of valuable crops like sugarcane can be effected by good fences and in submontane areas where there is trouble with wild animals like elephants, they have to be kept in check by the creation of natural barriers like mhotes or with the use of the hunter's gun. Among injurious birds, the omnivorous crow, the cosmopolitan house sparrow, pigeons, parrots of different kinds and some other grain and fruit eating birds which appear during certain seasons of the year are the most important of our bird pests. Different methods, including trapping, poisoning, scaring and shooting are employed to keep them in check.

Insectivorus Animals. Coming to the pleasanter side of the picture we find that, as in the case of insects feeding on other insects and often helping the farmer in controlling pests as parasites or predators, there are among non-insect animals also several forms which are insectivorous and which in many cases help us considerably in checking insect pests. These include toads, lizards, birds, bats, spiders, etc. Toads, lizards, chameleons, snakes and some fish play very important roles in nature in keeping insect multiplication under control. Flies, mosquitoes and numerous other insects are eaten by these amphibians and reptiles. Kirkaland in his account of his observations on the American toad, has found that its food is made up of 88% of insects of which 16% are the injurious cut worm caterpillars. The usefulness of some snakes as destroyers of rats and mice is also well known but unfortunately many a harmless snake meets with death at our hands for the fault of a few of their tribe. The more important of these insectivorous,

animals, however, belong to the group of birds though, as stated before, we have even among these, some which are notorious pests and some which take to both vegetable and insect food. Some of these insect-feeding forms play the role of very efficient natural checks of insect pests of different kinds though some of these insectivorous birds like the bee-eater (*Merops viridis)* cause damage by attacking the honey bee. The most important of these insect-feeding birds, helpful to the farmer, in the plains of South India are the mynah, the king crow, the roller, the hoopoe, the wood-pecker, the jailor bird, the bulbul, the tree pie, the fly catcher, the owl, the paddy bird domestic fowls, ducks and turkeys. Some of these birds voraciously feed on such injurious caterpillars and grass-hoppers like the swarming caterpillar of paddy and the allied cutworms, the castor semilooper white grubs, mango hoppers etc. The common crow being omnivorous is at once an injurious and a benificial bird ; it is graminivorous and consequently a domestic pest but it often does beneficial work by feeding on insects of different kinds. We commonly find the crow following the plough and feeding on underground grubs, caterpillars etc.

The agriculturist therefore will do well to encourage these beneficial birds in all possible ways and not tolerate the indiscriminate destruction of all birds either for sport or food. In areas badly infested with pests, perches may be supplied to useful birds in different parts of the field and for aquatic birds like ducks, etc., plenty of water may be let into the paddy fields to help the birds do their work actively. Such encouragement of useful birds is effected in many countries both by legislative and active measures. The killing of certain birds during particular seasons is prohibited. Useful birds are given nesting places and protection from enemies in the vicinity of cultivated areas.

An Experiment on the Introduction of Agricultural Improvements in villages on a mass scale.

By M. A. BALAKRISHNA AIYAR. L. Ag.

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Introduction. In a vast country like ours where conditions of soil, season, social customs and habits differ very widely from place to place, it is difficult to formulate a set of rules for universal application. Very wide general principles may be set down, but in their practical application, they must necessarily be modified to suit local conditions. The fact that the personal element, in the working of any scheme counts largely for its success or failure, has to be strongly emphasised.

In the scheme of work of the several development departments of the Government, the ultimate aim is to improve the condition of the rural population in all its aspects. The existing machinery for the purpose is inadequate and the results so far achieved are not obvious to people outside the departments concerned for the reason that they do not see the improvements all at one time and at one place.

In so far as the Agricultural Department is concerned a number of problems pertaining to cultural, varietal, manurial and other items are being tackled in the various Agricultural Stations and the results demonstrated to the ryots in the villages. But the extensive nature of the country, the absence of sound organisation among the ryots themselves, and more than all, the apathy of the ryots and their general dogmatic hold of the theory of fatalism are serious handicaps to orderly progress and uplift. The benefits of introducing a new strain in one village and the application of better cultural and manurial methods in another are not often known in other villages. Logical and progressive improvements are not to be seen and there is on the other hand stasis of a chronic type. For instance, in the North Arcot District some 20 years ago, ryots were growing soft-rinded striped canes. They were spending Rs. 20 to 30 worth of fuel to manufacture jaggery from an acre of cane. The Agricultural Department introduced a Java cane—247 B, and demonstrated a very efficient furnace for the preparation of jaggery, eliminating completely the use of wood as fuel for the purpose. Cane trash and megass alone were used as fuel in the new furnace for making jaggery. Incidentally other improvements like better methods of planting, manuring etc., were also demonstrated and ryots stood to gain up to Rs. 50 an acre, by abandoning their local cane and the old methods of cultivation and manufacture of jaggery. Even after two decades there are still some growers who adhere to the old wasteful methods. This shows that converting every ryot to new methods and ideas is not so easy as may appear on the surface. Traditional methods of cultivation filtered through ages are the ryots' stand-by. He often refuses to move forward and keep pace with the progressive elements to benefit himself. There is a constitutionally deep-rooted apathy.

The Single Village System. Considering the various limitations and the magnitude of the problem, the idea of tackling the problem in one village was taken up at the instance of the present Director of Agriculture. The village of Unai, in Vellore Taluk was selected for the purpose. A Demonstration Maistry was posted there and work was started on 1st March 1938. An association of the cultivators of the village as also of the neighbouring villages was formed with 47 members on the rolls. The work done there during the first 15 months is now reviewed.

The local agricultural practices and the possible improvements thereon were considered and in consultation with the members, it was decided to take up the following agricultural improvements. (1) Sowing *kolinji* (*Tephrosia purpurea*) for green manuring of all the single crop wetlands. (2) introducing Coimbatore seedling varieties of canes like Co. 281 and Co. 419 and adopting the cultural and manurial improvements in the cultivation of canes advocated by the Agricultural Department and (3) replacing the local *Chinna Samba* and *Sornavari* varieties of paddy with Co. 2 and Adt 12 paddy strains evolved by the Department. The aim throughout has been to make all the cultivators of the village and adjoining villages affiliated to the Association, take up the improvements in the cultivation of the

two major crops—paddy and sugarcane. Seven acres of *kolinji* for green manure, 3 acres of sugarcane varieties, 3 acres of Co. 2 and Adt 12 paddy strains were raised in the centre in 1938. During that year the rainfall was only half of the normal precipitation during the cropping season and the departmental methods introduced clearly demonstrated to the ryots that they stood to benefit by adopting them. The strains introduced resisted the drought extremely well.

The second season of activity has just commenced. As a result of intensive propaganda and demonstration done during the first season, the improvements taken up now in the block, compare favourably with those of last year. The block comprises the villages of Reddiyur and Unai, which are the main centres of activities of the Association.

Progressive areas under the improved crops.

Crop.	1938			1939		
	Quantity	Area in acres.	No. of ryots.	Quantity.	Area in acres.	No. of ryots.
Kolinji.	300 lb.	7	4	2,000 lb.	70	20
Sugarcane Coimbatore varieties.	35,000 setts.	3	3	2,00,000 setts.	45	37
Co 2. paddy.	75 lb.	2	2	1,640 lb.	40	24
Adt 12 paddy	34 lb.	1	1	500 lb.	10	7

It is seen that there has been considerable progress and that the ryots are following the improvements advocated by the department. The ryots would have purchased more of cane and paddy seeds and increased the area further this year but for the limited availability of seed at the time.

Other items of agricultural improvements were also demonstrated and adopted by the members of the association as well as by the non-members resident within the association area and the neighbourhood. They are :—

Purchase of ploughs ...	36	Circular water lift ...	1
Green manure seeds other than *kolinji* ...	477 lb.	Fish manure etc. ...	16 tons.
Seed coconuts	143	Paddy varieties other than Co. 2	500 lbs.
Cholam seed for fodder ...	60 lb.	Breeding bull	1
Poultry (Rhode Island Red)	4	Manure pits & dry earth sheds kept in good condition	70
Spraying dusting etc. ...	20 gardens.		

The original idea of the Director of Agriculture, Madras, was to ascertain the possibility of making the whole village take to the agricultural improvements. The scheme has been highly beneficial to the cultivators of the centre. The first year's work is full of promise and the end of the second year is likely to see tangible results. There would then be evidence of many-sided improvement. The man in the street does not recognise that there is only one demonstrator for every taluk with about 300 to 500 villages

and hamlets so that it is not possible to meet the needs of more than a limited number. Nor does he realise that the ryots do not readily take his advice and that in every case the demonstrator has got to see him a number of times before he could be induced to take up even a single item of improvement. That is not all. The demonstrator is sometimes looked upon with suspicion by the un-enlightened ryots. They imagine that the Government are employing the demonstrator ostensibly for effecting improvements in ryot's cultivation, but really with the object of increasing their land assessment.

There are about 200 *pattadars* here cultivating the lands themselves. Forty persons in the Unai area have so far been made to take up the improvements and there are about 160 more ryots who have to be brought round in the course of the next year. After that a maistry to be in close touch with the ryots as at present would not be necessary, for by that time the centre would reach a stage at which further propaganda would be wasteful.

An attempt is made below to compute the money value of the improvements so far carried out and the extent to which the members have gained by the formation of an organisation like the present one.

Kolinji	70 acres at	Rs. 5	of extra profit an acre	Rs.	350
Sugarcane	45 ,,	Rs. 15	,,	Rs.	675
Co. 2. paddy	40 ,,	Rs. $3\frac{1}{2}$	,,	Rs.	140
Adt. 12 ,,	10 ,,	Rs. 2	,,	Rs	20
			Total	Rs.	1,185

Other improvements mentioned earlier could be valued at Rs. 800 or so of extra profit for the ryots in this centre. When all the ryots here follow the suggestions made by the Agricultural department, they would be benefitted to the tune of nearly Rs. 10,000 in an year.

Though it may be possible to make the ryots take up agricultural improvements on a mass scale in a general way, it may also be stated here that it would not be possible to convert all the hundred per cent of the people. Many ryots lead a precarious existence and do not possess the where-withal to meet the cultivation expenses, the cost of seeds, manures etc. Their cultivation methods are primitive.

Supply of improved seed. The supply of pure seed in sufficient quantities is intimately bound up with the question of mass scale introduction of agricultural improvements. The variety that is used in the early season may be found unsuitable for the late season. If the seeds of both early and late varieties are stocked in quantities sufficient to meet the needs of all the ryots, either the one or the other would be left over unused as seed and may have to be sold later for consumption at a lower rate. The demand for seeds is influenced by the market to some extent If the price of jaggery should shoot up during the sowing season, there would be a demand for sugarcane setts, which may exceed the normal demand by

more than 3 or 4 times. It would indeed be difficult for a seed supply organisation to accurately forecast the demand for seeds well in advance, as it is subject to wide fluctuations caused by erratic markets and seasons.

Recently the Hon. Mr. C. Rajagopalachariar, the Premier has suggested that two suitable centres may be selected in each circle, and that the various improvements advocated by the department may be introduced in these centres on a mass scale, to guage the extent of economic uplift possible in these centres. The preliminary work done at Unai and the results obtained there, would, it is hoped, serve to encourage the demonstrators who may be called upon to work similar schemes. It is a new type of work, but that need not be less encouraging on that account.

SELECTED ARTICLE

The Scientist and The Farmer.

By Professor E. R. Hudson, Director of Canterbury Agricultural College, Lincoln.

Before dealing with particular instances of the way in which science is applied to agriculture it may not be out of place to dwell on some of the result now in evidence. Of outstanding importance is the fact that the fear of famine no longer exists. In these days when food stuffs are produced in abundance, and sometimes even a super-abundance, it is easy to overlook the fact that only a short time ago, historically speaking, widespread shortages of food were not uncommon. Science, as applied to agriculture, has removed one of the greatest fears which beset mankind. Not only are we producing our foodstuffs and similar requirements in greater quantities than ever before, but we are doing so with many less workers, and today, in most countries, the rural population is proportionately much smaller than in the past. In the primitive England of 1086, 76 per cent. of all the men were engaged in agriculture. In the United states of America in the 70 years from 1850 to 1920, the number of rural workers dropped. from 56 per cent to 26 per cent of all occupied persons.

Such changes, brought about by the application of modern methods — practically all due to science — are of tremendous significance. Now, to a greater degree than ever before in the history of the human race, the securing or producing of food has ceased to be the all-absorbing task of the majority of able-bodied men. For this reason the race is now free to move forward to the development of a standard of civilisation and of culture never before possible.

It is true that in the past certain groups of people, through specially favourable conditions, were able to provide themselves with a reasonably well assured and abundant food supply. Food-getting became an activity which did not occupy the full attention of the bulk of the people. It was under such conditions that civilisation developed and the fine arts and culture found a place. The valley of the Nile when occupied by the Ancient Egyptians is an instance of this.

In general, and throughout the world's history, advancement took place only in those regions where the problems of procuring food were at least partly solved.

On the other hand, in those areas and in those periods when the obtaining of a sufficiency of food was a serious difficulty, little or no advancement was made. The lessons of history would indicate that, through assuring us of an abundant food supply, the application of the physical and natural sciences to agriculture has opened the door to a new world, and the race is now free to move forward to the development of a standard of civilisation which was never before possible.

This new world is ours* to mould as we may. It is in our power to make it a heaven or a hell, and today we must admit that the one seems scarcely less likely than the other. Without labouring the point further, we can realise that the ease with which food and other raw agricultural products are now obtainable marks a fundamentally important stage in progress, but it is doubtful whether the average person realises to what extent existing conditions are made possible only through the application of science. For instance, we are all prone to overlook the fact that our modern machinery, which is playing so big a part in agricultural production today, is the outcome of the work of the physicist, the chemist, and other scientists. The fuel for our machines, the steel and other alloys of which they are so largely constructed, the rubber used for tyres and other parts, the paint which protects them from corrosion, and a hundred other things which are involved in their production and their functioning are the indirect products of the laboratory. The very homes in which we live are largely the indirect output of the scientist, and without his pioneering work modern buildings on the farm or elsewhere would not be available. Think for a moment of the importance of cement, of galvanised iron, of glass in such buildings.

One could give an almost unlimited number of examples of the way in which modern life is influenced by, and is dependent upon, the scientist. He is constantly evolving new materials and new methods which are adopted by industry and soon become accepted as a matter of course. Many of us do not realise that the scientist has been almost entirely responsible for shaping the world as we know it today. Let us now consider in greater detail some of the methods by which the scientist more directly influences our agriculture. It is difficult to know where to start, but to begin with we may consider a thing which greatly puzzled the ancients. It is possible to take a tub of soil, plant the seed of a tree in it, and, by adding nothing but water, produce a plant, the bulk and weight of which are many times greater than those of the soil in which it is rooted. What is the plant made of and how does it grow ? Careful scientific inquiry has supplied the answer. Today we have a full understanding, although not a complete knowledge, of plant growth and nutrition — important matters when we consider that all animal life, including that of ourselves, is dependent upon plant life The scientist has discovered that the bulk of the plant is derived from the atmosphere. but that certain small quantities of minerals must be derived from the soil.

These minerals are essential to plant growth, and if not available in sufficient amounts the growth is limited or, as the farmer would say, the crop is a failure. The chemist and the plant physiologist have studied the mineral requirements of our plants. We know what substances are liable to be deficient in certain soils. In New Zealand, as every farmer knows, we have a pronounced lack of phosphates, which we correct by applying phosphatic fertilisers — an everyday practice carried out by almost every farmer, who seldom pauses to think of the many years of scientific work which he calls to his aid when he applies superphosphate with his seed. One hundredweight of this fertiliser contains some 20 lb. of phosphoric acid, and is applied to an acre of soil, the upper 6-inch layer of which weighs approximately two million pounds. What the farmer does when he drills one hundredweight of super per acre is to apply to the soil 10 parts per million of phosphoric acid. Those 10 parts often represent the difference between a good and a poor crop, and sometimes the difference between a good crop and no crop at all. As with phosphates, so with many other plant foods. In some localities potash must be applied, in others, manganese. Cobalt may be lacking in another soil, and its deficiency is made evident in the losses which result among the animals grazed on such land. Borax is sometimes found to be necessary to ensure healthy plant growth. Only the scientist can solve the riddle of the deficient element.

The scientist does not work only in the laboratory. You will find him in the field conducting plot trials or examining the health, growth, and development of animals grazed on differentially treated areas. You may meet him in an office referring to statistics and examining records, pursuing every avenue which may lead to new knowledge. His tools of trade are not confined to the test tube and the microscope. Agriculture owes a great deal to the physicist, the scientist devoted to the study of matter and of energy. I have already referred to the influence of machines on modern life and modern methods of production. We are prone to give credit to the engineer for such machines, but behind the engineer is the physicist as well as the chemist. The engineer applies the knowledge gained by the scientist, just as in turn the farmer may use a tractor produced by the engineer. To the physicist we owe our knowledge of hydraulics, which we use in our drainage schemes, in our water supplies, and in our irrigation projects. He also has given us refrigeration. His studies of centrifugal force led to the production of the cream separator and the milk and cream tester. He gives us our electric light and power, as well as the magneto or the induction coil which is an integral part of our petrol engines.

No physicist of even a century ago could possibly have foreseen the many ways in which the knowledge he was painstakingly acquiring has been of benefit to mankind. The true scientist is concerned primarily with the discovery of new knowledge. Its application is a secondary consideration about which he is not so vitally concerned. Michael Faraday, one of the greatest of physicists, was one day working in his laboratory on what was a new discovery. He found that by turning a loop of wire in the space between two magnets an electric current was generated in the wire. At the time a lady visitor was being shown through the laboratory and Faraday, over-flowing with enthusiasm, explained to her what had just been discovered. "Yes", said the lady, "but, Doctor, what is the use of it?" "Madam", replied Faraday, "what is the use of a baby?" Faraday's "baby" has grown into a husky adult. On his discovery is based the construction of the electrical equipment which is used so freely today.

The layman often imagines that the botanist is concerned only with the naming and classification of plants. That is but a small part of his work. Of much greater importance is his study of plant growth. The systematic production of new types of plants and the selection of improved strains is a comparatively recent but most important development following upon the publication of the work of Mendel and upon a fuller understanding of genetics. The economic importance of applied botany would be difficult to over-estimate. Practically all of the crop plants grown today are the result of carefully controlled breeding and selection. As an example, it may be mentioned that in New Zealand by far the greater part of our wheat crop is produced from seed selected or specially bred at Lincoln. The yields have been increased, and the quality improved. Similar work is being done with a number of other crops and pasture plants. The result of such work is that, without additional cultivation or extra manuring, the farmer harvests a bigger crop and one of better quality.

Crop plants are subject to damage from various parasitic plants, especially fungi, and these low forms of plant life are liable to take a big toll. Their study forms the branch of botany known as mycology, and the mycologist contributes much to modern agricultural practice. In association with the plant breeder he produces resistant or immune varieties of crops. He has developed various steeps and dust which, if used on the seed, destroy the spores of the parasite. He has developed sprays and dusts for the direct control of other fungus parasites, and more recently he has undertaken an attack, as yet only partially successful, upon the newly recognised but widely distributed virus diseases of our cultivated

plants. The various branches of zoology have thrown light on many problems associated without animals and plants. The entomologist wages war against what is probably mankind's most serious enemy—insects. He has studied their habits and their life histories, and selects the weak points for his attack. He has developed insecticides of various types—sheep dip is a case in point—and he introduces one insect to prey upon another. The introduction of a parasite for the white butterfly will suggest itself as a well-known recent example.

The helminthologist devotes his attention to parasitic worms of various kinds, and in this branch of science steady progress is being made. Consider the story of the liver fluke, a parasitic worm which, fortunately, is not common in New Zealand, but which in the past resulted in large losses of sheep in other countries. Only the painstaking scientist was able to master it, and first he had to understand its life history. The eggs of the worm, when voided by the sheep, do not re-infest another sheep. After hatching, the young worm proceeds to parasitise a water snail, in which it develops into a form different from its parent. Its young parasitise the sheep. By destroying the snail the disease of the sheep is controlled. The new examples which I have brought to your notice may suffice to illustrate how dependent is modern agriculture upon the scientist. But the scientist cannot replace the farmer, and in some ways agriculture is not a science and never can be. It is an art.

The farmer may call to his aid all the scientific knowledge and modern equipment available, but he can never standardise his methods or his work. He lives too close to Nature for that. He has to contend with an ever-changing set of conditions. The hand of the agricultural clock rotates but once a year, and never are conditions the same in any two seasons. So long as we have variation in rainfall and other seasonal conditions, just so long will the art of agriculture be of outstanding importance. Science will remain a useful handmaid, but will not be the master of the competent landsman. *New Zealand Jour. of Agri.* 59: (1939) 121—126.

ABSTRACTS

Extraction of Saponin from Soap Nut. By J. L. Sarin and M. L. Beri, *Indus. and Eng. Chemistry*, 31 : 712. An efficient and commercially practicable method has recently been worked out at the Government Industrial Research Laboratory, Lahore, for the extraction of saponin from soap nut, a raw material which is found abundantly in India. The extraction of saponin from this source had not hitherto been possible on a commercial scale.

The soap nut selected for extraction was from the *Sapindus mikorossi* species and consisted of 56·2 per cent. pericarp and 43·8 per cent. seed. The pericarp, in which the saponin occurs, was sun-dried, powdered and extracted with ethyl acetate. The extract, on distillation, yielded crude saponin which was purified by dissolving in water and adding a solution of barium hydroxide. The precipitated barium salt of saponin was suspended in dilute alcohol and decomposed by carbon dioxide into barium carbonate and saponin. The saponin solution was evaporated and the resulting saponin recrystallised from ethyl alcohol. The yield was 30·31 per cent. on the weight of the pericarp and 17·17 per cent. on the weight of soap nut. This yield is higher than has been obtained from any other known saponin-yielding plant.

The soap nut saponin prepared could be utilized for the same purposes as saponin from other sources, e.g. as an emulsifying agent for vegetable and essential oils, as a foam stabilizer, in the manufacture of soapless shampoos and to increase the spreading power of sprays upon foliage—Abstract in *Tropical Agriculture*, 16 (1939) : 219.

Storage of Tropical Fruits—C. W. Wardlaw. *Nature* Vol. 144 pages 178—18-1939. Success in transporting fruits and vegetables does not depend on refrigeration alone. It has become necessary to investigate at least in part related biological aspects such as the physiological behaviour of different varieties questions of harvesting maturity, optimum conditions for harvesting, pre-storage and disinfectant treatments, the effect of different methods of wrapping and packing, post-storage treatments including ripening technique and wastage problems in general.

Tropical fruits have to be kept at suitably how temperatures to prevent rapid ripening and onset of wastage. The fruits have to be rapidly cooled and carried in cool storage (avocado 45°F., mangoes and tomatoes 47·5°F.) grape fruit, orange and lime 45°—50°F. Gros Michel bananas 53°F. Congo and Lactan bananas 56°—58°F., papayas 60°F.) if chilling injuries are to be avoided. Exposure to too low temperatures results in blemishes, failure to ripen and loss of resistance to fungal attacks.

Maintenance of correct humidity relationships within storage rooms or holds is of considerable importance. Relative humidity should not be so low as to allow serious loss in weight or modify the apperance and maturation of the fruit during storage period nor so high as to promote growth of fungal hyphae. Localised condensation within the congo sack must be avoided.

Bananas. The major aspect of banana investigations has been centred round the evolution of a variety to replace Gros Michel—which is best suited for storage and transport but is highly susceptible to the Panama disease. Two varieties I. C 1, and I. C. 2 have been evolved in Trinidad but the former has occasional seeds. I. C. 2 is very promising. The optimum harvesting maturity lies between '¾ full' and 'heavy ¾ full'. Thin grade fruit is difficult to ripen. 'Heavy ¾ full' fruit behaves well at 53°F. but ripens with an excessive odour of pear drops. During recent years a leaf disease due to *Cercospora musae* causes premature ripening and reduction in size of fruits. This has introduced complications in the storage problem.

Limes. Humidity is an important factor in storage of limes. Speedy handling, protection of fruits by suitable wrappers and rapid cooling to 45°F. are essential to the successful storage of this fruit. As with other citrus fruits limes are subject to superficial blemishing known as 'Obocellosis' resulting from mechanical injury to turgid fruits. To avoid this fruits should not be picked too early in the morning or too soon after the fruits have been covered with rain or dew.

Grape fruits. Unexpected results have been obtained in Trinidad. Thus when fruit is treated with borax solution before crating to prevent mould, the activities of *Colletotrichum gloeosperoides* are promoted. Iodised wraps also produce similar effects. Variations in keeping quality, susceptibility to chilling and to fungal disease are apparent in fruits from different localities.

Avocadoes. A distinctive feature of avocado is its high fat content. Most of the West Indian varieties are intolerant of temperatures below 50°F. In avocado maturation slowly continues even at relatively low tempe atures so that fruits ultimately become ripe. Only a few varieties combine requisite commercial qualities with adequate cold resistance.

Mangoes. These are readily subject to low temperature injury but it varies with variety, maturity at harvesting and season. Exposure to temperatures below 48°—50°F. results in chilling injury, superficial blemishing being accentuated by partial dessication. The wastage problem in mango storage is serious. Most of the fruits carry latent infections and these increase wastage due to

chilling, slow ripening and tardy distribution of ripe fruit. The high incidence of field infections directs attention to orchard sanitation.

Papayas. Little progress can be made in commercial storage until standardized supplies of fruit are available. The basic problem is to select and perpetuate good types from material which is notoriously variable. Trials show that immature papayas will not ripen after cold storage and most of the varieties show evidence of chilling if held below 55°—60°F.

Tomatoes. When picked full grown but green Trinidad fruit can be kept in cold storage at 40°—47° F. for 20—23 days and on removal to a higher temperature remains in good condition for 8—10 days. This is in marked contrast to the results on fruits grown outside the tropics. Trials at the Low Temperature Research Station at Cambridge showed that autumn fruits had poor keeping quality while summer fruits are more tolerant to low temperature.

T. S. R.

The present and the future of the Lime Juice Industry in India. S. S. Bhat *Agriculture and Live-stock in India.* The acidity of the juice ranges from 5 to 7·5 with the season, which makes it partially self preserved. The juice gets stale however, on storage. The addition of potassium metabisulphite, a useful and harmless preservative, in the proportion of 1 in 3,000 (2½ grains to a pound) preserves the juice. The discolouration of the juice is also prevented thereby. Bottling the juice, pasteurising it by immersion in a water bath with a false bottom at 70°C for half an hour, sealing and storage in a dark cool room which preserves the juice properly is advised. Cleanliness and asepsis are to be observed right through. Highly refined cane sugar may also be dissolved in the cold juice before pasteurisation. The addition of lime juice to sugar syrup and the boiling of the mixture and bottling is the general method of making lime juice cordial. The boiling takes off the fresh flavours, the full nutritive value and the natural colour of the product. The cordial gets brownish on boiling and darkens on storage. Lime juice may be mixed with juice of oranges and other citrus fruits and sugar and pasteurised, if desired. The presence of fruit cell matter in the bottled product gives an attractive appearance. The bitter taste and flavour of the lime rind oil helps to flavour the preserved product and to give fragrancy to the juice. The possibility of manufacture of lime juice in India, the production and demand, the problems connected with factory production, storage and marketing and finally the limiting factors are discussed. *V. T. S.*

Spraying with plant growth substances to prevent apple fruit dropping: F. E. Gardner, P. C. Marth, L. P. Bartijer—U. S. Horticultural station, Bureau of plant Industry, Beltsville, M. D.—*Science.* 90 : (1939) 208—209.

The late fruit drop of apple occurs in many apple varieties and other fruits just prior to and during harvest time and annually results in substantial losses. This fruit drop is, in general, a characteristic of early ripening varieties, but is also of frequent occurrence in a number of important midseason and late apples. As the fruit approaches maturity the danger of fruit dropping becomes more acute. In some varieties the fruit drop is sudden and disastrous while in some others it occurs steadily for several weeks prior to harvest.

Climate and weather are known to be important factors determining the feasibility of growing certain varieties in a given region.

Most of the commercial plant growth substances have the propensity, in varying degrees, of delaying the normal abscission of various plant organs. Among these naphthalene acetic acid and naphthalene acetamide have been reported as being particularly effective in delaying abscission of flowers of the date and holly. This property was made use of with more than gratifying results

to the problem of apple fruit drop by spraying the trees with the above named compounds.

Napthalene acetic acid and Naphthaline acetamide applied just prior to fruit maturity have proved to be particularly effective. Trials with indole acetic acid and indole butyric acid indicate that these indole compounds are much less effective than the naphthalene compounds.

A dilute concentration of 0·001% naphthalene acetic acid sprayed on Williams Early Red showed that in a fortnights' time the fruit drop in the sprayed trees was from 10·3 to 1·5% of the total crop whereas in the unsprayed trees the fruit drop was from 64·2 to 90·8%. Concentrations of ·00025% on other varieties have been found to bring about very marked inhibition of dropping. More experiments are carried on with addition of these compounds to the regular spray schedule. *S. K.*

EXTRACTS

Rat control. Of the common rat poisons investigated—thallous sulphate, yellow phosphorus, the alkaloid strychnine, zinc phosphide, red squills, white arsenic ($As_2 O_3$) and barium carbonate it is considered that all but the first three can be discarded as unsuitable for Queensland Cane field conditions.

The foods which have been used for bait bases can be listed in order of preference by the rats as follows :—rolled oats, cracked corn, whole corn, wheat meal, whole wheat, barley and bread. Rolled oats stand out above the others; there is very little difference between the next four, barley is not a food particularly desired by the field rat and there is always a very poor intake of bread.

It has been found that thallous sulphate and the alkaloid strychnine should not be used on bread, but it would be uneconomic and unnecessary to use phosphorus on a base other than bread unless an even cheaper bait base were available. The intake of thallous sulphate-treated grain decreases with bait strength. It is considered that under present methods of distributing thallous sulphate-treated grain in Queensland Cane fields i. e. in packet form—a bait strength approximating to 1 : 300 would be most economical.

The unsoundness of using " take " as a criterion for comparing the effectiveness of different poisons, baits or bait-strengths in the field has become evident. Thallous sulphate-treated wheat (1 : 500) usually exhibits a comparatively large intake per rat while phosphorus on bread is not particularly attractive to the pests. Nevertheless, it has been found that, in reducing field populations balit, with its extremely high toxicity, has about the same effect as an excellent take of the less toxic thallous-sulphate-treated wheat. It would appear that the addition of linseed oil to poison bait is unnecessary. (*Inter. Sugar Journal;* Vol. XLI. No. 486, p. 236, 1939.)

Extermination of white ants. All are familiar with the damage done by white ants, which are not really ants but termites. They live in colonies very similar to ordinary ant nests. The worker termites build the nest and forage for food, and they are equipped with very strong jaws with which they do the characteristic damage to timber. They alone are responsible for the damage. They are blind and have no sex. The soldier caste of termites protects the others from the attacks of small black ants which are their natural enemies. At certain times of the year the workers open the galleries normally sealed from the open air and let out winged males and females which fly off and on settling lose wings and begin new colonies.

Termites commonly eat their dead, also they have a habit of grooming each other, which consists of licking their bodies, and these habits make it possible to poison them.

The Council for Scientific and Industrial Research has done much valuable research work on the habits of termites. Termites derive their main food from the wood which is digested by the workers. It has been found that they do not generally attack wood deeper than one foot below the surface of the ground. They are able to build tunnels across brick, concrete or metal in order to get at timber floors above. Termites can digest lime water and have been known to travel right up through a wall built in lime mortar to attack timber in the roof above. Once white ants have been found in timber and the galleries which lead back to their nest broken into, they will leave that piece of timber unless very massive, and break out in another direction. The Council for Scientific and Industrial Research recommends great care in locating their tunnels, which should be bored and white arsenic blown in by means of an insect powder blower. The hole should be plugged. The worker ants will then carry back to the nest minute quantities of arsenic, which will in a month or so destroy the whole colony. The process is not rapid but it is certain. Where mounds are accessible, as in the open, a hole should be bored well down into it and about ½ oz. of arsenic blown in, and the hole plugged. Investigators have found that as small a quantity as 1/16th of an ounce will destroy complete colonies in a year, but 1/8 oz. will destroy them in 3 months. Half an ounce was found to completely destroy the colony in one month, and since arsenic is cheap the latter dose is the most economical. Half an ounce is two level teaspoonsful. I have found this method most effective and members can try it if they are troubled with white ants, with confidence and at small expense. *Jour: Dept. Agr. S. Australia* 43 (1939): 49.

Gleanings.

Digestibility of Straw. Straw contains large quantities of carbohydrates which can be only partially digested by farm animals. Various attempts have been made to increase the digestibility of straw by some pre-treatment.

In the course of an investigation of the problem, oat and wheat-straw were treated with caustic-soda solutions of varying strengths and for varying lengths of time.

Best results were obtained with a 1·25 per cent solution and an immersion period of 20 to 24 hours without heating. With the volume of solution used, this represented 10 pounds of caustic soda per 100 pounds of straw. The starch equivalent per 100 pounds of straw was more than doubled by the treatment.

Treated oat-straw fed to fattening bullocks resulted in a daily livestock gain of just under two pounds over a period of 62 days.—*Nature.* Reproduced in (*Scientific American*, Vol. 161, No. 3, p. 161).

A New Wood Preservative. An American patent (Am. P. 21,49,284) by A. Gordon, Berkely, Cal., U. S. A., describes the composition of a new wood preservative. According to the details contained in the Deutsche Bergwerks Zeitung (No 178, Aug. 1939), 63·2 kg. of copper sulphate crystals ($CuSO_4 . 5H_2O$) are dissolved in 200 kg. of water; the copper is precipitated by the addition of caustic alkali obtained by dissolving 20·224 kg. of sodium hydroxide in 50 kg. of water. The precipitate is dissolved in an ammoniacal solution (17·75 kg. of ammonia in 1000 kg. of water) and to this solution of cupric ammonium hydroxide is added 21·2 kg. of "arsenic" (presumably the pentoxide) and 0·6 kg. of ferric acetate. The preservative thus obtained can be diluted with (up to) three parts of water. It is claimed that wood impregnated with a solution of this composition would retain the copper and arsenic in insoluble (and therefore unleachable) forms and thus remain immune to the action of wood-destroying organisms. *Current Science* 8 (1939): 436.

Indian Drugs for Treatment of Cattle. The Imperial council of Agricultural Research has sanctioned three schemes, at a cost of over a lakh of rupees, for research in Indian drugs to be used in the treatment of cattle. The schemes will cover investigations into the cultivation of medicinal plants, the efficacy of indigenous drugs and the indigenous treatment of cattle.

Lt. Col. R. N. Chopra, of the School of Tropical Medicine, Calcutta, has been granted Rs. 62,860 for a five years' scheme. The researches under this scheme cover the survey of medicinal plants which can be grown in India, chemical analysis of their pharmacological and therapeutic action and an investigation of food poisons, particularly in cereals.

The second scheme which will be a study of poisonous plants and of their doses required in veterinary practice, will be controlled by the Surgeon-General of Madras. This will be a three years' scheme and will cost Rs. 39,000, The object of the scheme is to examine how far indigenous drugs can take the place of the imported ones.

The third scheme sponsored by the Premier of Orissa, is for the collection of *literature about cattle treatment* by *indigenous drugs*. It has been sanctioned initially for a period of six months at a cost of Rs. 4,500. Information from manuscripts and other sources is being collected and collated.

As two of these three schemes are veterinary, they will be correlated to the comprehensive survey of cattle diseases already being made by the Imperial Veterinary Research Institute, Mukteswar, through the Veterinary investigation officers. (*Current Science* Vol. 8, No. 9).

Correspondence.

To

The Editor, Madras Agricultural Journal.

I. A device for scaring birds.

Sir,

The damage to cereal crops by birds at the time of grain ripening is known to be considerable and various devices are in use in different tracts to minimise this loss.

The care-crow, the boy scarer, the use of empty tins and pop guns deserve particular mention.

The scare-crow either in the shape of pie-bald spotted old earthern pots or in the guise of stuffed bizarre human figures with a watchman's proverbial stick are more intended for immunity against 'evil eyes' than actual frightening of the bird visitors.

The boys employed to sit on watch on improvised raised platforms in the centre of the fields with slings and stones, or empty kerosene tins, or both are fairly effective. They make sufficient noise by shouting and beating the drum and by pelting the visiting groups with stones. They in addition serve as day watchmen.

At Adoni, and in many parts of the Ceded Districts, an explosive mixture made out of chlorate of potash and sulphur is in use for this purpose and the simulation of a sound like gunshot appears to be ideal as a device for scaring birds. The method and its economics are given below for the information and benefit of ryots in other tracts and is recommended for a wider adoption on account of its efficiency.

The *dimmi* as the device is called, consists of a hollow iron cylinder about two to three feet long and ¾ inch broad, soldered to a cup about one inch thick at the bottom. There is a small opening at the side of the cup through which

the explosive powder is introduced into the cylinder. An iron rod with a T handle which runs into the cylinder when acted upon, causes an explosion with a loud report.

The initial cost of the *dimmi* will be about Rs. 2. The explosive mixture costs annas twelve a seer and this quantity, when judiciously used, will last for a month. Old unused pipes cut to size and closed at one end are quite handy.

Cotton Breeding Station,
Adoni, Nov. 5, 1939.

Yours &c.,
K. Raghavan.

II. The use of Guntakas in puddling rice fields.

Sir,

The *guntaka* or blade harrow is well known in all tracts in our country, where the seed drill is in use. It is used for a variety of purposes in dry lands, e. g. covering seed, stirring soil, harrowing and intercultivating crops. But its use in puddle may be a novelty and hence this note. Normally five ploughings are given to wetlands before rice is sown or transplanted in puddle. With the use of this implement three ploughings can be dispensed with and a saving of Rs. 2 to Rs. 3 per acre effected in preparatory cultivation depending upon the tract. Trials were made with H. M. Guntaka No. 2, No. 1 and No. 0. The local *guntaka* (wooden body and iron blade) also was used. In heavy soils, lighter guntakas such as No. 1 and No. 0 will be more suitable. For growing rice under puddled conditions inversion of soil is not of much consequence. When this *guntaka* is worked after one or two ploughings with the country plough the unploughed land left between the furrows is also cut and a homogenous puddle is obtained. I shall be glad if some readers of your Journal would try this implement for puddling and record their experience for the benefit of others.

St. Thomas Mount,
Nov 12, 1939.

Yours &c.
R. Swami Rao.

Agricultural Jottings.

(From the Director of Agriculture, Madras).

TIRUVOTTIYUR MILCH CATTLE MARKET

Madras, Friday the 14th October 1939.

The period of heavy arrivals of cows and buffaloes from the Ongole tract has commenced and the arrivals are nearly double of those of last week. Sales too have increased during the week as the quality of stock has improved. Prices, however, are steady.

The following gives the stock movements during the week ended 13th October 1939.

	Stock at commencement.	Arrivals during the week.	Sales during the week.	Balance.
Cows-Ongole	140	142	132	150
Buffaloes-country	220	218	186	252
Buffaloes-Delhi.	9	...	...	9

Prices.

Age.	Milk yield.	Prices ranging. From	To
		Rs.	Rs.
Cows-Ongole.			
1st and 2nd calving	2—3 Madras Measures.	70	90
	3—4 ,, ,,	90	120
3rd and 4th calving	2—3 ,, ,,	55	70
	3—4 ,, ,,	70	110
Buffaloes-country.			
1st and 2nd calving	2—3 ,, ,,	60	90
	3—4 ,, ,,	90	110
3rd and 4th calving	2—3 ,, ,,	55	70
	3—4 ,, ,,	70	90
Others.			
Baffaloes-Delhi.		120	200
Cows-Cross bred.		150	200

Market Report No. 16.

Madras, Friday, the 20th October 1939.

The arrivals during the week were rather restricted compared to those of previous week. The market remained quiet throughout the week. The stock movements during the week ending 20th October 1939 were as follows :—

	Stock at Commencement.	Arrivals.	Sales.	Balance.
Cows-Ongole	170	72	91	131
Buffaloes-country	252	40	154	138
Buffaloes-Delhi	9	6	5	10

Prices.

Age.	Milk yield.	Price ranging From	To
		Rs.	Rs.
Cows-Ongole.			
1st and 2nd calving	2—2 Madras Measures	80	90
	3—4 ,, ,,	90	120
3rd and 4th calving	2—3 ,, ,,	55	70
	3—4 ,, ,,	70	110
Buffaloes-country.			
1st and 2nd calving	2—3 ,, ,,	60	90
	3—4 ,, ,,	90	110
3rd and 4th calving	2—3 ,, ,,	55	70
	3—4 ,, ,,	70	90
Others.			
Buffaloes--Delhi.		120	200
Cows-cross bred.		150	200

Market Report No. 17.

Madras, Friday the 27th October 1939.

Owing to inclement weather the arrivals of stock were poor both in quantity and quality. The cattle market remained fairly steady though a slight fall in buffalo prices was in evidence. The stock movements during the week ended 27th October 1939 were as follows :—

	Stock at Commencement.	Arrivals.	Sales.	Balance at the end.
Cows-Ongole	131	77	108	100
Buffaloes-country	138	52	80	110
Buffaloes-Delhi.	10	...	5	5

Prices.

Age.	Milk yield.	Prices ranging From	To
		Rs.	Ra.
Cows-Ongole.			
1st and 2nd calving	2—3 Madras Measures	70	90
	3—4 „ „	90	120
3rd and 4th calving	2—3 „ „	60	70
	3—4 „ „	70	110
Buffaloes-country.			
1st and 2nd calving	2—3 „ „	55	80
	3—4 „ „	80	100
3rd and 4th calving	2—3 „ „	50	60
	3—4 „ „	60	80
Others.			
Buffaloes-Delhi.		120	180
Cows-cross bred		150	200

Market Report No. 18.

Madras, Friday the 3rd November 1939.

Due to stormy weather in the Ongole area the arrivals of cows and buffaloes were extremely poor and as a consequence the stock of animals at the market is low. The prices, however, have not improved and the low prices of buffaloes continue. The stock movements during the week ending 3rd November 1939 were as follows :—

	Stock at commencement.	Arrivals.	Sales.	Balance at the end.
Cows-Ongole	100	38	76	62
Buffaloes-country	110	50	58	102
Buffaloes-Delhi	5	...	...	5

Prices.

Age.	Yield of Milk.	Prices ranging. From	To
		Rs.	Rs.
Cows-Ongole.			
1st and 2nd calving	2—3 Madras Measures	70	90
	3—4 „ „	No stock	
3rd and 4th calving	2—3 „ „	60	70
	3—4 „ „	70	120
Buffaloes-country			
1st and 2nd calving	2—3 „ „	55	70
	3—4 „ „	70	100
3rd and 4th calving	2—3 „ „	50	60
	3—4 „ „	60	80
Others			
Buffaloes-Delhi.		120	160
Cows-cross bred.		120	180

Market Report No. 19.

Madras, Friday the 10th November 1939.

Arrivals of cows and buffaloes have improved over those of last week though they are still low. The market is dull but prices are steady.

The stock movements during the week ending 10th November 1939 were as follows :—

	Stock at Commencement.	Arrivals.	Sales.	Balance at the end.
Cows-Cngole	62	70	62	70
Buffaloes-country	102	74	66	110
Buffaloes.Delhi	5	...	2	3

Prices.

Age.	Yield of milk.	Prices ranging From	To
		Rs.	Rs.
Cows-Ongole.			
1st and 2nd calving	2—3 Madras Measures	70	90
	3—4 „ „	90	120
3rd and 4th calving	2—3 „ „	60	70
	3—4 „ „	70	110
Buffaloes-country.			
1st and 2nd calving	2—3 „ „	55	70
	3—4 „ „	70	100
3rd and 4th calving	2—3 „ „	50	60
	3—4 „ „	60	80
Others.			
Buffaloes-Delhi.		120	160
Cows-Cross bred.		120	180

Crop and Trade Reports.

Statistics—Crop—Gingelly 1939—40—Intermediate condition report. The gingelly crop has been affected to some extent by drought in parts of Vizagapatam, Bellary, Anantapur, Nellore, Chingleput, Chittoor and Coimbatore and by an attack of insect pests in parts of Ramnad. The yield is expected to be normal outside these districts.

The wholesale price of gingelly per imperial maund of 82 2/7 lbs. (equivalent to 3,200 tolas) as reported from important markets on 6th November 1939 was Rs. 6—8—0 in Vizianagaram and Cocanada, Rs. 6—6—0 in Vizagapatam and Tinnevelly, Rs. 6—1—0 in Trichinopoly, Rs 5—11—0 in Rajahmundry, Cuddalore and Tuticorin, Rs. 5—9—0 in Ellore and Rs. 5—7—0 in Salem. When compared with the prices published in the last report, i. e. those which prevailed on 9th October 1939, these prices reveal a rise of approximately 6 per cent in Cuddalore and a fall of approximately 5 per cent in Trichinopoly, 4 per cent in Vizagapatam, Rajahmundry and Tuticorin and 2 per cent in Ellore, the prices remaining stationary at other centres.

Statistics—Paddy—1939—40—Intermediate Monthly report. The harvest of first crop paddy is proceeding in East Godavari and has either concluded or is concluding in parts of the Central districts, the South and the West Coast. The yield is reported to be nearly normal in the West Coast and below normal in the other districts. The standing crop is reported to have been affected to some extent by insect pests in parts of the deltas of the Godavari. The condition of the crop is reported to be generally satisfactory in the other districts.

The wholesale price of paddy, second sort, per imperial maund of 82 2/7 lbs. as reported from important markets on 6th November 1939 was Rs. 3—1—0 in Madura, Rs 2—14—0 in Vellore, Rs. 2—13—0 in Trichinopoly, Rs. 2—12—0 in Chittoor, Rs. 2—11—0 in Virudhunagar, Rs. 2—10—0 in Vizianagaram and Rajahmundry, Rs. 2—9—0 in Ellore, Bezwada, Guntur and Tinnevelly, Rs. 2—8—0 in Cocanada, Masulipatam and Kumbakonam, Rs. 2—7—0 in Conjeeveram, Rs. 2—4—0 in Negapatam, Rs. 2—3—0 in Hindupur, Rs. 2—2—0 in Cuddalore, and Rs. 2—0—0 in Anantapur. When compared with the prices published in the last report, i.e. those which prevailed on 9th October 1939, the prices reveal a rise of about five per cent in Conjeeveram, three per cent in Guntur and Tinnevelly and two per cent in Rajahmundry and Madura, and a fall of about five per cent in Hindupur and three per cent in Nagapatam, the prices remaining stationary in the other markets.

Statistics—1939—Crop—Groundnut—Intermediate condition Report. The condition of the winter crop of groundnut is reported to be generally satisfactory except in parts of Chingleput, South Arcot, Tanjore, Madura and Ramnad where the crop is said to have been affected to some extent by hairy caterpillar and "Surul".

The wholesale price of groundnut (shelled) per imperial maund of 82 2/7 lb. (Equivalent to 3,200 tolas) as reported from important markets on 6th November 1939 was Rs. 5--2--0 in Cuddalore, Rs. 4-13-0 in Vizagapatam and Tadpatri, Rs. 4—12—0 in Guntur, Rs. 4—10—0 in Vizianagaram, Rs. 4--3—0 in Anantapur, Rs. 4-0-0 in Nandyal and Hindupur, Rs. 3...15...0 in Bellary, Adoni and Coimbatore and Rs. 3-14-0 in Cuddapah. When compared with the prices published in the last report, i.e., those which prevailed on 9th October 1939, these prices reveal a rise of approximately 6 per cent in Guntur, 3 per cent in Cuddalore and 2 per cent in Bellary and a fall of approximately 3 per cent in Vizianagaram, Adoni and Hindupur and 1 per cent in Vizagapatam, the prices remaining stationary in Nandyal, Cuddapah, Coimbatore and Anantapur.

Statistics—1939—Crop—Sugarcane—Intermediate condition report. The condition of the sugarcane crop is generally satisfactory except in South Arcot where the crop has been slightly affected by stem-borer in parts. The yield is expected to be normal in all districts outside Vizagapatam, South Arcot and North Arcot where it is estimated to be slightly below normal.

The wholesale price of jaggery per imperial maund of 82 2/7 lb. (equivalent to 3,200 tolas) as reported from important markets on 6th November 1939 was Rs. 9—5—0 in Adoni, Rs. 8—7—0 in Vizagapatam, Rs. 8—1—0 in Cuddalore, Rs. 8—0—0 in Rajahmundry, Rs. 7—14--0 in Chittoor, Rs. 7—7—0 in Salem, Rs. 7—6—0 in Cocanada, Rs. 7—4—0 in Vellore, Rs. 6—10—0 in Vizianagaram, Rs. 6—9—0 in Erode, Rs. 6—7—0 in Trichinopoly, Rs. 6—6—0 in Bellary Rs. 5--14--0 in Mangalore and Rs. 4--14--0 in Coimbatore. When compared with the prices published in the last report, i.e., those which prevailed on 9th October 1939, these prices reveal a rise of approximately 8 per cent in Vellore, 6 per cent in Vizagapatam, Adoni and Mangalore, 5 per cent in Chittoor and 3 per cent in Rajahmundry, the prices remaining stationary at other centres.

Statistics--1939--40--Cotton--Intermediate monthly report. In the Central districts and the South, the sowings of cotton are still in progress in parts. The area under the crop is expected to be normal or slightly above normal.

In the Deccan, the sowings of *hingari* or late cotton have concluded and the area is expected to be above normal. The crop has been benefited by the rains of October and is progressing well. The yield from *mungari* or early cotton in parts of the Deccan is expected to be slightly below normal.

The local cotton trade is not generally active at this time of the year. The average wholesale price of cotton lint per imperial maund of 82, 2/7 lbs. as reported from important markets on 6th November 1939 was Rs. 16—13—0 for Cocanadas, Rs. 15—10--0 for red-Northerns, Rs. 14--4—0 for white Northerns, Rs. 15--3--0 for Western (mungari crop) Rs. 17--3--0 for Westerns (jowari crop), Rs. 26--8--0 for Coimbatore Cambodia, Rs. 24--12—0 for Coimbatore-Karunganni, Rs. 23--10--0 for Southern-Cambodia, and Tinnevelly-Karunganni, Rs. 21--5--0 for Tinnevellies and Rs. 19--7—0 for Nadam cotton. When compared with the prices published in the last report, i.e. those which prevailed on 2nd October 1939, the prices reveal a fall of about four per cent in the case of Westerns (jowari crop) and Southern Cambodia, three per cent in the case of Cocanadas, Westerns (mungari crop) and Tinnevellies, two per cent in the case of Coimbatore-Karunganni and one per cent in the case of Tinnevelly Karuganni and Nadam, the prices

remaining stationary or practically so in the case of Coimbatore Cambodia and Northerns (red and white varieties).

Statistics--Cotton--1939--40--Second Forecast Report. The average of the areas under cotton in the Madras Province during the five years ending 1937--38 has represented 9·9 per cent of the total area under cotton in India.

The area under cotton up to the 25th September 1939, is estimated at 776,900 acres. When compared with the area of 833,200 acres estimated for the corresponding period of last year, it reveals a decrease of 6·8 per cent. The decrease in area occurs in most of the important cotton growing districts owing mainly to the want of timely and sufficient rains.

The area in the Central districts and the South relates partly to the last year's crop and partly to the current year's sowings which have commenced in parts.

The condition of the standing crop is generally satisfactory.

The average wholesale price of cotton lint per Imperial Maund of 82 2/7 lb. as reported from important markets on 2nd October 1939 was Rs. 17--5--0 for Cocanadas, Rs. 15--10--0 for Red-Northerns, Rs. 14--4--0 for white-Northerns Rs. 15--11--0 for Westerns (Mungari crop) Rs. 17--13--0 for Westerns (Jowari crop) Rs. 26--9--0 for Coimbatore Cambodia, Rs. 24--11--0 for Southern Cambodia, Rs. 25--4--0 for Coimbatore-Karunganni, Rs. 23--14--0 for Tinnevelly-Karunganni, Rs. 22--1--0 for Tinnevellies and 19--11--0 for Nadam Cotton. When compared with the prices published in the last report, i.e., those which prevailed on 4th September 1939, the prices reveal a rise of about five per cent in the case of Northerns (red and white) 12 per cent in the case of Nadam, 14 per cent in the case of Coimbatore Cambodia, 18 per cent in the case of Southern Cambodia, and 20 to 25 per cent in the case of the other varities of cotton. *(From the Director of Industries and Commerce.)*

Cotton raw in the Madras Presidency. The receipts of loose cotton at presses and spinning mills in the Madras Presidency from 1st February to 10th November 1939 amounted to 446, 651 bales of 400 lb. lint against an estimate of 388, 900 bales of the total crop of 1938-39. The receipts in the corresponding period of the previous year were 481,047 bales. 367,694 bales mainly of pressed cotton were received at spinning mills and 176,358 bales were exported by sea while 128,520 bales were imported by sea mainly from Karachi and Bombay. *(From the Director of Agriculture.)*

College News & Notes.

Students' Corner--Students' Club--Debate. "That in the opinion of the house India should give unconditional support to Britain in the present international crisis" was the subject of a debate held on 26-10-39 in the Free-man Hall under the Chairmanship of Miss I. H. Lowe, M. Sc. (Lond) Inspectress of Schools, Coimbatore. Mr. R. C. Broadfoot was the observer.

Games:-Inter-Collegiate Cricket. On 21-10-39 The Agricultural College played the local Govt. College on home grounds. Batting first the home team amassed a huge total of 339 (S. V. Srinivasan 170, Narayana Kamath 33, Shanker Rao 37, K. S. Ramaswami 23, and B. S. Krishnan 24. Natesan 4 for 78). S. V. Srinivasan's score of 170, included 17 fours. It was a delightful innings, where the batsman gave an all round display. This total is the highest of his career and incidentally this is the highest individual score gathered by any batsman on our grounds. The Govt. College were all out for 72, Sankaranarayanan alone making 29. S. V. Srinivasan captured 7 wickets for 36 runs. The Govt. college followed on and

compiled a total of 183 in their second venture and thus lost the match by an innings and 84 runs, (Srikant 50, Sankaranarayana 45, Palaniyappan 25, S. V. Srinivasan 4 for 40 and Ramaswami 4 for 60)

The Agricultural College students' team played the Theosophical college, Madanapalli on the 28th and 29th of October at Madanapalli. Entering first the Agricultural College scored a total of 98 runs. (Narayana Kamath making 30, S. V. Srinivasan 16 and Vijayaraghavan 13 not out (Raghupathi 4 for 16 and Gopalu 3 for 33.) Batting next, the Theosophical college reached a poor total of 27. S. V. Srinivasan was chiefly responsible for skittling the rival team, bagging 6 wickets for 11 runs Of the remaining wickets, Somanna secured 3 for 15 runs. In the second innings, the Agricultural college gathered 118 runs for 7 wickets before declaring their innings, closed, S. V. Srinivasan 37, Mohiuddin 37.) The Theosophical college were all out for 67 in their second innings S. V. Srinivasan again securing the bowling honours by capturing 7 wickets for 34 runs, while Somanna took 2 for 7. By defeating the Madanapalli college, the Agricultural college has qualified to meet the Madura American college in the Semifinals of the inter-zone contest.

In the inter divisonal contest, the Agricultural college met the American College, Madura, in the Semifinal round on the 18th and 20th of October on home grounds. The ball beating the bat was a feature of the match. Winning the toss the Agricultural college elected to bat. The home team collapsed for a very meagre total of 62 runs. The skipper, K. M. Somanna in scoring 33 (not out) played a captain innings, and rose up to the occasion to save his side from a miserable collapse. The bowling and fielding of the visiting team was of a very high order and the team is to be congratulated on its good performance. Mumandi captured 4 wickets for 7 runs and Vijayan 2 for 11. The American college entering next fared worse and were all out for 53, (S. V. Srinivasan 5 for 28, K. M. Somanna 4 for 19).

With a lead of 9 runs the home team entered on their second innings and were all dismissed for 71, (S. V. Srinivasan 31, K. M. Somanna 25, Chandra Babu 3 for 20, Devanasan 2 for 15 Vijayan 2 for 21) Requiring 81 runs for a win the visitors, began their 2nd innings. The atmosphere was tense with excitement as the Agricultural college team took the field. The first wicket fell for 3, the 2nd for 8, and 3rd for 17 and 4th for 20. Great enthusiasm continued during the play and the visitors were dismissed for a paltry 47 and the Agricultural college thus won the match by 33 runs, which has qualified them to the finals to be played at Madras. K. M. Somanna deserves to be specially congratulated for scoring 58 out of a total of 133 scored by his side and for capturing 9 wickets in the match.

Local Cricket Matches. A combined team of the Agricultural College and Government Arts College played the Kerala cricket club at the Agricultural College grounds in a friendly fixture on 11-11-39. The home team put up a total of 92 (N. Kamath 20, Ramanathan 19, Raghavan 6 for 33 and Narayanan 4 for 32.) The visitors scored 97 runs for 7 wickets and won the match by 3 wickets and 5 runs. K. Narayanan 34, P. M. Raghavan 26. Padmanabhan 2 for 30 Sundaran 2 for 19.)

On 12-11-39 the Agricultural College team assisted by two officers of the college played the Kerala cricket club on home grounds. Entering first the home team collected 217 for 8, and declared (Mohiuddin 24, C. N. Babu 52, Kodandaraman 40, K. M. Somanna 60, Raghavan 2 for 39). The K. C. Club entering next were out for 54, Kodandaraman running through the side in a deadly spell capturing 7 wickets for 14 runs.

Hockey—In the Coimbatore Athletic Association Hockey Tournament, college met Stanes High School in the first round on 19-10-39 and lost by one goal, which was shot during the extra time.

On 8-11-39 our team played the inter collegiate hockey match against St. Josephs' College, Bangalore on Stanes' grounds. Keshava Reddy scored the first goal and this lead was kept up till the last minutes when the St. Josephs' centre forward netted the ball and the match ended in a draw for the day. Replaying the match on the next day our college sustained a defeat by 2 goals to nil, despite the spirited defence of Ayyappa in the back line against the repeated onslaught of St. Josephs' forwards.

Officers' Club Day Tournament Results. The following are the results of the tournaments conducted by the Agricultural College officers' club during the Annual Club day held on 21-10-39.

Item.	Winners.	Runners up.
1. Tennis (Singles) (C. Ramaswami's Cup)	C. N. Babu.	N. Muthuswami.
2. Tennis (Doubles) (Rao Bahadur G. N. Rangaswami Ayyangar's Cup)	M. K. Krishnaswami & K. M. Thomas.	K Sanjiva Shetty & R. L. N. Ayyangar.
3. Contract Bridge (open) Padmanabha Shield & N. L. Dutt's Cup)	G. K. Chidambaram R. K. Ayyangar.	K. S. Subba Rao & Gopala Ayyar.
4. Contract Bridge (Partners by lots) (K. Ramiah's Cup)	K. S. Subba Rao & G. L. N. Rao.	C. Rajasekahara Mudaliar & D. V. Reddy.
5. Table Tennis (M. C. Cherian's Cup)	N. Muthuswami.	D. V. Reddy.
6. Carrom (Single) (K. Krishnamurthy Rao's Cup)	C. H. Krishnan.	R. Kodandaraman.
7. Carrom (Doubles) (Shiva Rao's Cup)	C. H. Krishnan & D. V. Reddy.	P. K. Menon & Kodandaraman.
8. Chess (Vellodi's Cup)	E. J. Varghese.	T. K. Mukundan.

Inter-Collegiate Sports, Madras University. The athletic sports for the Bangallore Division comprising of Ceded Districts colleges, Anantapur; St. Joseph's College, Bangalore; Theosophical College, Madanapalle; Voorhees' College. Vellore; Islamia College, Vaniambadi; Municipal College, Salem, Government Arts College, Coimbatore and the Agricultural College, Coimbatore were held in the Agricultural College maidan on the 6th and 7th November 39. Out of the eight colleges only St. Joseph's college Bangalore, Voorhees' College, Vellore and two local colleges competed. The events were keenly contested. The St. Joseph's College Bangalore won the first place in hop, step and jump 400 metres dash, pole vault, 200 metres race, long jump, shot put, 1500 metres, and 100 metres race while the Agricultural College won the 1st place in 200 metres hurdles 110 metres hurdles, and high jump. The championship was, won by the St. Joseph's College scoring 51 points as against 34 points obtained by the Agricultural College.

Foot and Mouth Disease. A vigorous campaign against foot and mouth disease is carried on by the central farm, Coimbatore, owing to the prevalence of this foul disease of cattle in the vicinity of the estate. As a result of restricted wheeled traffic and vigorous disinfectant measures taken, the animals in the Central Farm are so far free from the disease.

Visitors. Dr. J. A. Mulyil, B. A., Ph. D., Biological Control officer of the Imperial Institute of Agriculture, New Delhi camped here from 13th to 20th instant. He addressed the students of the Agricultural College on "Biological control of Insect pests" on 17-11-39 at the Freeman hall.

A party of 20 students from the District Board Industrial and Agricultural School, Sivaganga, led by their Headmaster Sri. D. T. Danapandian, B. A., B. Sc. Ag., L. T., an alumnus of our College stayed in the Estate from 14-11-39 to 17-11-39 for getting themselves acquainted with the work done by the Agricultural Department.

Monsieur Koesnoto, Agricultural expert, Department of economic affairs Batavia arrived in Coimbatore on the 19th Nov. and stayed till the 22nd during which period he visited the millets, cotton and Imperial sugarcane stations and the oil seeds laboratory in order to acquaint himself with the work on these crops. He also visited the Research Institute and Central Farm during his stay and proceeded to Madras *en route* to Calcutta.

Season. An unusual rainfall of 12·18" was received (as recorded at the research Institute) during October. For the last 33 years, this record has been surpassed only once during 1930, when during October, the rain-fall was 16·03". While these showers were welcome after 4 years of droughty conditions, a better distribution of the rains would have been more helpful. Cambodia cotton sown early in September has not been much affected, but later sown dry cottons were caught too early by the rains. Rain-fed cholam which was coming into ears has been rather adversely affected. The monsoon has not still abated, as during the 15th, 16th and 17th of November, there was unceasing rainfall amounting to 3·5 inches. Further rains under present conditions will not be helpful for some time.

An Announcement—Ramaya Shetty Memorial fund. A sum of Rs. 83 collected by well wishers of the late M. Ramaya Shetty (Farm Manager, Cotton Station, Coimbatore) has been offered to the Madras Agricultural Students' Union by the trustees of the fund. This amount will be utilised for the institution of a rolling silver cup to be awarded during the Annual College Day Sports for 220 yards dash.

Entomological Society of India. Meetings of the South Indian branch of the above association were held in Coimbatore on the 13th and 14th of October and also on the 8th of November. The local members were present and Sri M. C. Cherian presided. The following interesting papers were read and discussed:—

1. The need for intensive systematic studies on Indian insects by Dr. T. V. R. Ayyar.

2. Snails as pests of paddy by M. C. Cherian.

3. *Spathius vulnificus* as a possible parasite for the control of the cotton stem weevil by P. N. Krishna Ayyar and P. S. Narayanaswami.

4. *Tetrastichus ayyari*, Rohwr., a pupal parasite of sugarcane and cholam borers' by M. C. Cherian and C. K. Subramaniam.

5. *Geomermis indica* St. a new nematode parasite of the Cotton stem weevil' by P. N. Krishna Ayyar.

6. Anophelene mosquitoes of Coimbatore and its surroundings by T. V. Subramaniam.

A large number of interesting specimens of insects were also exhibited.

Weather Review—OCTOBER 1939.

RAINFALL DATA

Division	Station	Actual for month	Departure from normal @	Total since January 1st
Circars	Gopalpore	8·1	+0·4	30·7
	Calingapatam	10·0	+2·0	28·2
	Vizagapatam	14·6	+7·5	29·1
	Anakapalli*	13·6	+6·0	35·7
	Samalkota*			
	Maruteru*	24·4	+17·2	41·9
	Cocanada	29·5	+21·6	52·0
	Masulipatam	24·4	+16·3	41·4
	Guntur*	17·5	+11·9	33·3
Ceded Dists.	Kurnool	3·3	−0·2	16·5
	Nandyal*	0·0	0·0	0·0
	Hagari*	7·6	+4·3	20·9
	Siruguppa*	4·6	+0·5	21·2
	Bellary	6·7	+2·8	16·9
	Anantapur	4·6	+0·9	23·6
	Rentachintala	10·7		25·2
	Cuddapah	4·6	−0·4	22·8
	Anantharaju-pet*	8·0	+3·4	21·5
Carnatic	Nellore	15·1	+6·7	24·7
	Madras	5·1	−6·6	19·8
	Palur*	10·0	−0·4	33·1
	Tindivanam*	10·3	+1·4	27·9
	Cuddalore	16·3	+5·3	45·5
Central	Vellore	9·1	+2·8	29·2
	Salem	10·9	+4·2	43·6
	Coimbatore	11·8	+5·4	20·9
	Coimbatore A. C. & R. I.*	12·2	+6·5	21·9
	Trichinopoly	12·8	+5·9	33·1

Division	Station	Actual for month	Departure from normal @	Total since January 1st
South	Negapatam	8·6	−1·9	30·1
	Aduthurai*	13·9	+5·3	37·5
	Madura	6·3	−1·5	30·4
	Pamban	1·4	−7·6	10·3
	Koilpatti*	0·0	0·0	0·0
	Palamkottah	3·1	−3·7	9·8
West Coast	Trivandrum	7·7	−2·9	53·1
	Cochin	16·8	+3·6	123·7
	Calicut	11·8	+1·6	109·1
	Pattambi*	8·4	−3·8	88·7
	Taliparamba*	0·0	0·0	0·0
	Kasargode*	5·8	−3·4	115·8
	Nileshwar*	11·0	+1·7	115·6
	Mangalore	7·9	+0·4	112·4
Mysore and Coorg	Chitaldrug	4·6	+0·3	28·2
	Bangalore	7·5	+1·6	32·4
	Mysore	10·4	+3·9	27·5
	Mercara	11·8	+3·1	99·1
Hills	Kodaikanal	11·1	+1·4	44·5
	Coonoor			
	Ootacamund*	13·2	+8·5	47·2
	Nanjanad*	9·6	+2·3	42·9

*Meteorological Stations of the Madras Agricultural Department.

@ From average rainfall for the month calculated upto 1937 published in the Fort St. George Gazette.

Weather was generally fine over the Madras Presidency for the first ten days of the month with scattered thundershowers but the seasonal change in the distribution of pressure over the Bay of Bengal had begun to set in, and determined the influx of sea winds into the peninsula. About the 15th conditions became unsettled in the Central region of the Bay but failed to develop further, and by the 17th conditions became unsettled in the South East Arabian sea off the Malabar Kanara Coast; and developing into a depression moved out in a North West direction and became unimportant by the 21st. On the 20th conditions became unsettled in the Bay off the Coromandal-Circar Coast which by the 21st developed into a depression, passed inland on the 22nd and lay over North Deccan till the 25th when it became unimportant. Conditions again became unsettled off the Coromandal-Circars coast on the 29th, which developed into a depression and crossed the coast near Cocanada by the 31st. The Arabian sea depression and the two Bay depressions gave rise to widespread and locally heavy rains from the middle of the month. Rainfall was particularly heavy on the Coastal

area between Nellore to Cocanada during the passage of the two Bay depressions, and occasioned much damage to crops and property in that area.

Rainfall was in very large excess on the south Circars coast, in the central districts, parts of the Deccan, Mysore and Coorg and the hills, locally in the Carnatic and normal or in slight defect elsewhere.

Chief reports of rainfall:—

Cocanada.	...	6·7″ on 22nd.
Masulipatam.	...	4·9″ on 21st.
Maruteru.	...	7·9″

Special reports of heavy rainfall:—

Narasapur.	...	10·4″	30th.
Bhimavaram.	...	10·3″	30th.
Tanuku.	...	6·6″	30th.
Ellore.	...	5·7″	30th.
Nellore.	...	5·5″	29th.

Weather Report for Research Institue Observatory.

Report No. 10/39.

Absolute maximum in shade.	...	91·0°F.
Absolute minimum in shade.	...	64·0°F.
Mean maximum in shade.	...	87·7°F.
Departure from normal.	...	+0·2
Mean minimum in shade.	...	70·7°F.
Departure from normal.	...	+0·3
Total rainfall for the month.	...	12·18″
Departure from normal.	...	+6·5
Heaviest fall in 24 hours.	...	2·53 on 31st.
Number of rainy days.	...	12
Mean daily wind velocity.	...	1·6 m. p. h.
Departure from normal.	...	−1·2 m. p. h.
Mean humidity at 8 hours	...	82·8 %
Departure from normal.	...	+2·9 %

Summary. The rainfall of the month was 12·18″ which was more than 100 % in excess of the normal, this being the first occasion since 1930 when so large a fall has been recorded. The rain was associated with the disturbances in the Arabian Sea and Bay of Bengal. The heaviest fall in 24 hours was on the 31st when 2·54″ was recorded. Skies were in general heavily clouded and temperatures in slight excess. Mean humidity at 8 a. m. was in slight excess and wind velocity below normal.

P. V. R. & F. L. D.

Departmental Notifications.

Gazette Notifications.

Appointments.

Sri S. Ramachandra Ayyar, Assistant, Entomology Section, is appointed to Category 7 of Class I, Madras Agricultural Service, and to officiate as Assistant Entomologist with effect from the date of taking charge *vice* Sri. P. N. Krishna Ayyar on other duty.

Sri. P. N, Krishna Ayyar, Assistant in Entomology, I grade, and officiating Assistant Entomologist, Coimbatore, in category 7, Class I, Madras Agricultural Service, is appointed to be temporary Parasitologist, Coimbatore, in the same category, with effect from the date of taking charge.

Transfers.

Name of Officers.	From	To
Sri. K. Unnikrishna Menon,	Dy. D. A. (on leave)	Dy. D. A., Coimbatore.
„ C. Ramaswami Nayudu,	Offg. Dy. D. A., Coimbatore.	J. L. A. & Asst. Supdt., Central Farm, Coimbatore.
„ M. Kanti Raj Nayudu,	Offg. J. L. A. & Asst. Supdt. Central Farm Coimbatore.	Offg. as gazetted Asst. to the Principal, Coimbatore.
„ R. N. K. Sundaram,	Dy. D. A., III circle, Trichinopoly.	Asst.. D. A., Bellary.
„ A. Ramaswami Ayyar,	Offg. Supdt., A. R. S., Anakapalli.	Offg. Asst., D. A., St., Thomas Mount, Madras.
„ R. Swami Rao,	Asst., D. A., St. Thomas Mount, Madras.	Asst. D. A., Guntur.
A. Gopalakrishnaiyah Naidu,	Affg. Asst., B.A., Guntur.	Offg. Asst., B.A., Nellore.

Leave.

Name of Officers.	Period of Leave.
Sri. M. U. Vellodi, Asst. D. A., Tellicherry,	L. a. p. for one month and 21 days from 1—11—39.

Subordinate Services.

Appointment.

Sri. A, Mariakulandai, officiating Assistant in Chemistry Section, is appointed as Temporary Assistant in Chemistry in the Animal Nutrition Scheme financed by the Imperial Council of Agricultural Research, with effect from 1st November 1939 in the post liberated by Sri. Y. V. Narayana Ayya.

Transfers.

Name of officers	From	To
Sri S. Veeravarada Raju	A. D., Trivellore (on leave)	A. D., Madanapalle.
„ M. Subramanya Chetty	Asst. in Cotton A. R. S., Guntur	1st circle,
„ P, Parthasarathy		A. D., Puttur under training
„ P. S. Narayanaswami	Asst. in Entomology, Coimbatore	Special duty at Payyanur for 4 months.
„ N. Krishna Menon	Asst. in Entomology, Coimbatore	Special duty at Vadavanur, Palghat.
„ V. N. Subbana Acharya	Offg. Asst. D. A., Bellary	A. D., II circle.
„ R. Govindan Nambiar	F.M., A,R.S., Taliparamba	A.D., Cheyyar.
„ K. Gurumurthi	A.D., Chellapalli	Tobacco market yard Supdt., Bezwada.
„ P. Sudarsanam Naidu	A. D. Masulipatam	Tobacco market yard Supdt , Mangalagiri,
„ Y. Venkateswar Rao Naidu	A. D., Bapatla	Tobacco market yard Supdt., Ongole.

„ K. V. Gourangamurthy	A. R. S., Maruteru	A. D., Nandigama.
„ N. V. Narasimha Sastri	A. D., Guntur (on leave)	A. R. S., Anakapalli.
„ R. Subbiah Pillai	A. R. S., Palur	A. D., Ambasamudram.
„ S. Ponnuswami Naidu	A. D., Ambasamudram	A. D., Atmakur.
„ N. Subramanya Ayyar	A. D., Kulitalai	F. R. S., Kodur.
„ L. Narasimhacharya	Offg. Asst., A. D., Nellore	A. D., Chittor.

Leave.

Name of officers.	Period of leave.
Sri L. Krishnan, A. D., Tanjore	L. a. p. on m. c, for 1 month from 5—11—39.
„ M. S. Purnalingam Pillai, Asst. in Cotton Section, Coimbatore	L. a. p. for 1 month and 6 days from 16—11—39.
„ P. Lakshminarayana, Asst. A. D., Cocanada	Extension of l. a. p. for 4 months from 4—11—39.
„ S. Venkatarama Ayyar, A. D., Sriperumbudur	L. a. p. for 2½ months from 3—1—1930.
„ K. S. Krishnamurthy Ayyar, A. D., Trichinopoly	Extension of l. a. p. for 1 month and 14 days from 8—11—39.
„ G. Ganapathy Ayyar, Asst. in Chemistry, Coimbatore	Extension of l. a. p. for 1 month from 2—11—39.
„ P. S. Krishnamurthy Ayyar, Entomology Asst., Bellary	L. a. p. for 1 month and 29 days from 23-10-39.
„ V. K. Kunhunni Nambiar, F. M., A. R. S., Pattambi	L. a. p for 2 months from 22-10-39.
„ U. L. Srinivasa Rao, A. D., Kollegal	L. a. p for 1 month from 20-10-39.
„ C. Annamalai, A. D., Madanapalli	L. a. p. for 1 month from 6—11—39.
„ Uchil Ananda, F.M., A.R.S., Pilicode	L. a. p. for 29 days from 23—11—39.
„ R. Subbiah Fillai, A. R. S., Palur	A. D., Ambasamudram.